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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
Bulletin 85

A MONOGRAPH OF THE JUMPING PLANT-LICE OR PSYLLIDÆ OF THE NEW WORLD

BY

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WASHINGTON
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BULLETIN OF THE UNITED STATES NATIONAL MUSEUM.

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RICHARD RATNBUN,
Assistant Secretary, Smithsonian Institution,
In charge of the United States National Museum.

WASHINGTON, D. C., *April 30, 1914.*

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A MONOGRAPH OF THE JUMPING PLANT-LICE OR PSYLLIDÆ OF THE NEW WORLD.

By DAVID L. CRAWFORD,[1]

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INTRODUCTION.

The family Psyllidæ, or the Jumping Plant-lice, have received comparatively little attention in the New World, especially from the systematic point of view. A relatively small number of species have been described, but no serious attempt has been made to relate the several genera represented by these species.

The European forms have received a great deal of attention, notably by Dr. Franz Loew and now by Dr. Karel Sulc. Others have made some contributions, but in a much more unrelated manner. With the two names just mentioned, the name of Witlaczil should not be omitted. Some very good work on the internal anatomy has been done by him.

Until 1848 only a few genera were recognized, most of the species being placed in *Psylla*. At that date Foerster divided *Psylla* into several smaller genera, most of which are still valid. In 1878 Loew published his Zur Systematik der Psylloden, in which he established several additional new genera and tabulated four subfamilies—Triozinæ, Psyllinæ, Aphalarinæ, and Liviinæ. With the exception of the latter, these were separated from each other on the basis of wing venation characters.

In his subsequent work he followed this same system of classification and there soon appeared more subfamilies and many more genera. Other workers during and since his time have employed his system of classification, also. The basic diagnostic characters used by Loew in this system were largely venational. The presence or absence of the cubital petiole (M+Cu), and the relative length of this petiole, when present, and the radial stem (or discoidal subcosta), were the two principal characters for the separation of subfamilies.

In undertaking systematic work on a large collection of Psyllidæ some four years ago, Loew's system of classification was employed because it was practically the only one to be used. The collections before me were very large and contained very large series of specimens of many species, in which there would naturally be more or less variation. It was soon found that by Loew's system very closely related species were thrown into different genera and even different subfamilies. Sometimes, too, specimens of the same species were separated into different subfamilies. This was true especially of several species of *Aphalara* and of related genera.

---

[1] Contribution from the Entomological Department of Cornell University, Ithaca, New York. This supersedes the former papers by the author on this group.

As the work progressed and other large collections were studied, many unsatisfactory features were found in this system and a great many difficulties encountered. Some of these have been mentioned in more or less detail in my former papers on this group. It became apparent that any classification based principally on wing venational characters would be artificial and unsatisfactory. At the same time other characters were noted that seemed to be more fundamental and whose use in classification seemed to place together certain obviously related genera.

The form of the head, for instance, was found to be very significant in diagnosis. In some genera the frons is a visible sclerite between the genæ, while in others it is completely covered by the genæ which in the latter case are nearly always produced into conical processes. Genera related or separated on this character were found to be distinctly related or separated in other structural characters, as well.

The form of the vertex, and that of the pleurites of the prothorax and of the pronotum, the armature of the hind tibiæ, and several other structural characters, have been found to correspond closely in certain groups of genera. These, naturally, do not divide the genera into sharply defined groups, but the groupings are, at least, more sharply defined and less artificial than by Loew's system.

As a result of this study, a complete rearrangement of the genera of Psyllidæ is herein presented. While only the American genera are treated in this monograph, yet most of the genera of the world have been considered in connection with this new system of classification, and it appears that this system will be very satisfactory for all.

The American genera have been arranged in six subfamilies—Liviinæ, Pauropsyllinæ, Carsidarinæ, Ceriacreminæ, Triozinæ, and Psyllinæ. Some of these are new names and those which have already been used are here used with different limits, representing a different group of genera. Each is described and discussed under its own subhead and need not be discussed here. It should be noted, however, that the old subfamily Aphalarinæ is not recognized. Its typical genus, *Aphalara*, has been transferred to the group Liviinæ, and the other genera formerly placed in it have been referred to Psyllinæ or some other subfamily.

Some confusion has arisen in the past over differences in the nomenclature of the external sclerites, and these differences have been due largely to our imperfect knowledge of the homologies of these external parts. In the following pages a brief discussion of the homologies of the sclerites is given, with an explanation of the terms used in the systematic portion of this work.

MORPHOLOGY.

Anatomical studies on the family Psyllidæ are not numerous, but in proportion to the systematic work on the group they are quite extensive. All of this work has, however, been based on a relatively small number of species and therefore the results are not entirely accurate.

The most extensive of these works was by Emmanuel Witlaczil in 1885, Die Anatomie der Psylliden. The largest and most important part of this paper is on the internal anatomy, with a relatively small part on the external morphology. He discusses in more or less detail the following subjects: Segmentation of the body wall, musculature, wax glands, tracheal system, nervous system, digestive canal, circulatory system, reproductive organs, and finally the relationships of the family to the other groups of Homoptera, both the Phytophthires and the higher groups.

Loew ('76:187–194) discusses very briefly the external anatomy, but in a very general way. H. B. Stough ('10:121–165) has more recently studied the morphology of the hackberry psyllid, *Pachypsylla c.-mamma* Riley. This latter work is not altogether satisfactory from the point of view of clarity and definiteness, and also shows several errors in the interpretation of sclerites. It may be stated, however, that the species of *Pachypsylla* are among the most difficult for the purpose in view—of homologizing sclerites of Psyllidæ with those of other Homoptera—and this may account for the errors.

Some very good work has been done by Miss Patch ('09:117–121) on the wing veins of Psyllidæ, homologizing them with the veins of Aphididæ, Coccidæ, and Aleyrodidæ. The Comstock-Needham system of nomenclature of veins as applied to many other groups of insects has been applied here by Miss Patch. Because of its simplicity and superiority in all ways the same nomenclature is followed in the taxonomic work of the present paper.

No attempt has been made by the writer to go into the internal anatomy of the Psyllidæ; nor is the external morphology presented in as much detail and completeness as would be desirable if the scope of the present work were not so limited. There are many very curious and remarkable developments in the members of this family, and several sclerites which are difficult to homologize satisfactorily with other Homoptera. These must be studied more carefully before the conclusions can be relied upon with absolute certainty. Certain phases, therefore, of the external morphology are presented in somewhat of a tentative manner.

The present study has been based on a large number of species, representing many genera of the family, as follows: *Livia vernalis* and *L. coloradensis*, *Aphalara veazici*, *Pauropsylla* sp. (a Javanese species), *Paurocephala magnifrons*, *Apsylla cistellata* (Indian), *Phacopteron lentiginosum* (Indian), *Heteropsylla texana*, *Euphyllura arbuti*, *Arytaina robusta*, *Psyllopsis fraxinicola*, *Psylla alni americana*, *Psylla pyricola*, *Trioza diospyri* and *T. albifrons*, *Paratrioza arbolensis*, and many others compared but studied less carefully.

Apsylla cistellata, an Indian species, is somewhat generalized and proved to be very valuable for indicating the path of specialization in the more highly specialized forms, or those considered to be more typical of the family. It was pointed out in the description of this species (Crawford '12c:421, 429) that it was scarcely psylline in many respects, and in fact the generic name, *Apsylla*, was suggested by that fact. Many developments so complicated and so highly specialized in *Psylla* that it is extremely difficult to understand them become much clearer when the Indian species is compared with them.

The methods of study used have been both gross dissections and microtome serial sections in balsam. The dissections were made in a liquid—alcohol, cedar oil, or glycerine being the best, and for most purposes alcohol the best—and under a binocular microscope with a magnification of about sixty diameters. The specimens were first softened, cleared and distended in a warm, strong solution of caustic potash and then placed in a watch glass on the microscope stage with a strong tungsten light directly beneath the stage. In this way the sclerites of the exo-skeleton become easily visible because of the semitransparent and distended condition of the body wall. By means of fine needles and special tweezer-like scissors the insect may be very easily dissected.

Another method of dissection which proved to be very valuable and which is offered as a suggestion to others for similar work is as follows: Soak the specimens in warm caustic potash for ten or twelve hours, then place in water for a few minutes, and dehydrate with alcohol; then soak in cedar oil for several hours and imbed in paraffine. With a microtome, section away one-half of the insect, either longitudinally or sagitally, dissolve away the paraffine from the remaining unsectioned half with xylol, and mount in balsam with the cut surface up. No staining is necessary unless a chitin stain is used in cases where the body wall is mostly depigmented and transparent. A half insect mounted with the open side up shows with remarkable clarity and perspective the internal skeleton and the internal side of the sutures. This method was found to be valuable also for the study of the musculature, but of course for this the specimen must be first fixed alive instead of soaking it in caustic potash.

As a third and very essential method of study serial sections of specimens fixed in various fluids were used. Transverse, sagital, and longitudinal sections were made.

HEAD.

Figs. 1, 3, 5, 15, 17, 21.

The head of the members of Psyllidæ in the essential parts is not materially different from that of other Homoptera. In appearance it is very variable within the family because of the peculiar prolongations of the genæ or the vertex or some other part of the head.

The *vertex* is a large dorsal sclerite comprising usually most or all of the top of the head and divided by a median suture which is always easily visible (fig. 5). At the extreme posterior angles of the vertex are the two posterior ocelli. The surface of the vertex is variable, being sometimes flat, or more often with irregular depressions or foveæ, or sometimes rounded forward and downward. Its shape also is variable from quadrate to triangular or semicircular, or each of the two lobes may be rhomboidal.

The *frons* has in most cases been overlooked in the Psyllidæ and the clypeus erroneously called the frons. In *Psylla*, *Trioza*, and many other genera the frons is scarcely visible as a sclerite, but in some species it is very prominent, as, for instance, in *Paurocephala magnifrons* (fig. 16) and *Livia*, *Aphalara*, and several other genera. In all cases it is present as a small or large sclerite bearing the anterior ocellus at its base or the end nearest the vertex. In many species of *Psylla* the ocellus is imbedded between the vertex and the genæ and no frons is at first apparent. After careful examination, however, the small sclerite of the frons becomes visible below the ocellus and between and beneath the genal cones (figs. 15, 21).

The shape and form of the frons is very variable. In *Paurocephala magnifrons*, a Mexican species (fig. 16), it is a relatively large, conspicuous, pentagonal sclerite occupying an anterior position on the head (actual, not relative), with the vertex articulating on the two sides, the genæ on two sides and the clypeus on the fifth side or apex. The anterior ocellus is at the base, the same relative position as in all the other species. The sutures and sclerites are almost diagrammatically clear in this species.

In *Livia* (fig. 20) *Rhinocola*, *Aphalara* (fig. 18), *Aphalaroida*, *Paurocephala* (fig. 16), *Pauropsylla*, *Heteropsylla*, some species of Carsidarinæ, and others the frons is very distinct but occupies an inferior position on the head and is more elongate and the sutures sometimes less distinct than in the Mexican species mentioned above. In these forms, too, the anterior ocellus is borne at the base of the frons (the apex of the head), and the frons appears sometimes as the stalk of the ocellus. As stated above, the frons in *Psylla* and many other genera has been suppressed and becomes almost invisible in some cases. In *Pachypsylla* it is so small and indistinct that Mr. Stough overlooked it as a sclerite and called it the "ligamentary process attaching the frons (really the clypeus)[1] to the head." Figure 15 is from a sagital section through the front ocellus and the frons. The suture between the vertex and the frons is very distinct just above the ocellus. The frons is seen to extend downward beneath the genal cones which lie over it and to attach to the clypeus a little farther down (fig. 15).

A complete and very interesting series may be found within the family, showing the suppression of the frons from a large and prominent sclerite to a very small one which is little larger than the ocellus attached to it. The variation of the frons in many other groups of the Homoptera is very similar, and there is little doubt but that a comparative study of this sclerite throughout the whole suborder would throw much light on the taxonomy of the group and the relations of the families within the group.

The *genæ* are very large and comprise the largest part of the head ventrad.[2] In *Livia* (fig. 20) the genæ are two sclerites, lying one on each side of the elongate frons and between the vertex in front and the clypeus behind. In all cases the antennæ are attached on the edge of the genæ near the vertex. The variation in the form and shape of the head is due mostly to the variability in the form of the genæ. From the simple condition as mentioned above for *Livia* there is a gradual pushing outward of the genæ to form two spherical lobes or two conical processes projecting downward or forward. These processes have had various interpretations, and various names have been assigned to them. Some writers have called them frontal cones, or frontal lobes, or frontal processes; Slingerland called them "cones of the clypeus"; Loew and other European writers have called them *stirnkeln,* and *coni frontales.* The writer in previous papers has called them facial cones, a noncommittal term. Stough is inconsistent in recognizing the sclerites from which these cones arise as the genæ and yet calling these processes *frontal cones,* and at the same time calling the clypeus the frons, a sclerite which has no relation to the cones whatever. The term *genal cones* is applied to these processes in the taxonomic work of the present paper, and, of course, this is the only possible interpretation of them.

Usually the genæ are inferior in position, but in some species of Carsidarinæ, notably in *Carsidara* (figs. 150, 151) a part of the top surface of the head—what appears to be the vertex—is formed by the genæ. The vertex consists of a pair of narrow oblique lobes with the front ocellus far from the front margin of the head, and the genæ forming the front part of the head with the antennæ attached on their front margin. In *Euphyllura*, also, a part of the top of the head is formed by the genæ (figs. 34, 36).

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[1] The parenthesis is my insertion.

[2] In all of this discussion the position of the sclerites is described as actually found in the Psyllid head, and not as in the typical or generalized insect.

Behind the eyes is another sclerite, the *occiput*, which is often not easily distinguished from the genæ, although the suture between it and the vertex above is always distinct. In *Livia* this is very large and extensive (figs. 3, 20), and the sutures are distinct. In most of the genera, however, it is less extensive and more closely fused with the genæ. The occipital foramen is surrounded by this sclerite.

The *clypeus* is a relatively large sclerite and very prominent. It is usually pyriform or cordate in shape, but sometimes more or less conical (*Aphalara calthae*, *Paurocephala ilicis*, and *Ceropsylla johnsonii*). The large end usually overlaps on the frons and often covers a large part of the latter, as in *Psylla*, *Trioza*, and many other genera. It is often obscured from view from in front by the genal cones which project downward in front of it. The other end converges rapidly toward the labrum and labium (fig. 15). The suture between the clypeus and labrum is quite distinct (in a good preparation), dividing off a relatively small and short labrum. Stough ('10: pl. 29, fig. 1) has indicated an extra suture in the clypeus, and thus the proper number of sclerites is obtained after omitting the frons and calling it the ligamentary process. The epipharynx is a very small and inconspicuous sclerite.

Appendages of the head.—The labium in the Psyllidæ is very peculiar in being sharply flexed at a point between the forecoxæ and the distal portion extending perpendicularly downward. This distal portion only is movable, the basal part being held rigidly between the forecoxæ. The basal segment is thin, being membranous in appearance but really well chitinized. It is more or less internal, being covered partially by the prosternum. At the beginning of the second segment, or at the tip of the first, the labium makes a sharp turn and passes downward. If the head were in the normal position of a generalized insect, this sharp turn would be perpendicularly upward. The furcæ from the prosternum are large and heavily chitinized. The second labial segment passes down directly in front of this and is apparently supported and strengthened by it. In some species, *Psylla alni americana* for instance (fig. 15) it seems to be partially surrounded by the furcæ. The labium passes out between the legs of the furcæ and immediately behind the forecoxæ, thus appearing to arise from the prosternum instead of the head. The distal portion of the second segment and all of the third is outside and forms the visible *beak* or *rostrum*. The latter is movable and may be exserted and drawn in more or less, being movable on, or within, the profurcæ.

The mandibular and maxillary setæ are attached near the base of the clypeus and pass out along the labium. They are very long, often very much longer than the labium.

The *eyes* are large and usually more or less hemispherical, projecting laterad from the side of the head. The facets are relatively very large. In *Livia* (fig. 20) the eyes are peculiarly flattened, and are peculiar, too, in having a tubercle (*pre-ocular tubercle*) projecting partly into their front margin. This resembles very much an ocellus and may possibly be some kind of a sense organ. There are three ocelli, as mentioned above; two on the vertex and one on the frons.

The *antennæ* are nearly always ten-segmented, rarely nine- and only abnormally eleven-segmented. They are attached to the genæ near the margin of the vertex, sometimes near the lateral margin of the genæ, and sometimes more toward the front. The first two segments are always larger and shorter than the following joints. The third is nearly always the longest, the others each being shorter than the preceding one. The terminal segment is thickened a little and bears two thick setæ of unequal length. In some genera (*Pauropsylla* and others) these setæ are half as long as the antennæ. Scattered over the surface of the intermediate segments are hairs, probably sensory, which in some species, *Homotoma* species for instance, are very abundant. There are also a considerable number of sensory areas of various kinds, some being simple differentiated rings or pits, and others being of a rather complicated structure. Further study of these undoubtedly will bring to light many interesting forms of sensory apparatus. The living psyllid moves the antennæ rapidly and almost continually; sometimes the movement is so rapid that it might well be called vibration.

THORAX.

Figs. 1-4, 6-12.

In proportion to the rest of the body the thorax of the Psyllidæ is very large. It has become specialized by the habits of leaping of the insect, and is not only large and strong but some of the sclerites are most remarkably developed. This is true especially of the meso- and metathorax.

The *prothorax* is short. The notum consists of a single sclerite which is arched over behind the head. The extent to which it reaches downward on each side varies in the different genera. In *Livia* it is large and extends down laterad to the forecoxæ (fig. 3), while in *Psylla* and *Trioza* it extends only about halfway down toward the coxæ (figs. 1, 4, 6-8). Near each lateral extremity, in most species, is a foveal impression which sometimes is very prominent. The lateral extremity may be more or less swollen and knoblike, as in

Aphalara (fig. 166) or it may be uniform to the margin and the suture between it and the pleurites indistinct.

The *pleurites*, in most genera, are easily visible, but in *Livia* they are less so (fig. 3). The pleural suture is distinct, extending from the base of the forecoxæ to the lateral extremity of the pronotum. The episternum may be equal in size to the epimeron, or it may be larger, but it is seldom smaller. A small trochantin is usually visible at the lower end of the episternum.

The taxonomic value of the form of the pleurites of the prothorax has been emphasized elsewhere in this paper. In some genera, as in *Aphalara* (figs. 1, 166), the pleural suture extends to the middle of the knoblike lateral extremity of the pronotum, while in others, as in *Psylla* (figs. 4, 8), it is oblique and extends to the posterior edge of the lateral extremity of the pronotum, and the latter is not knoblike. The episternum is often more or less covered by the receding eye and occiput (*Euphyllura*, fig. 35), or both pleurites may be so covered. The epimeron often is partially concealed by the conjunctival membrane between the pro- and mesothorax.

The *prosternum* is greatly reduced in most genera, the forecoxæ being contiguous and occupying most of the space. In *Apsylla*, however, the prosternum is much larger and the forecoxæ are not contiguous (fig. 9). In fact, the condition in this genus in this regard resembles very much the nymph of the more specialized genera. In the latter genera the furcæ of the prosternum are strongly developed, as pointed out in connection with the labium. The attachment of the furcæ on the sternum is not strongly chitinized, but a short distance from the base they become very thick and strong, forking about midway from base to apex. The apical arms are very heavy and knobbed at the end and roughened. Several very large muscles are attached here.

Between the pro- and mesothorax are three small chitinized sclerites which are not visible on a dried specimen unless it be distended by means of a warm liquid. One of these is the peritreme bearing the mesothoracic spiracle and is, therefore, not part of the prothorax. Lying close to the upper margin of the peritreme and sometimes not separated from it is a second sclerite which is sometimes small and elliptical and extends only a little above the upper edge of the propleurites, and sometimes long and narrow and extends far up between pro- and mesonotum. In *Apsylla* these two sclerites are one (fig. 2), while in *Trioza albifrons* (fig. 7) they are divided only by a line. In other species they have become more or less separated, but it seems obvious from the two species mentioned above that the upper sclerite is only a part of the peritreme, which has become separated for some reason from the lower part. Stough called this upper sclerite the epimeron of the prothorax, having overlooked or disregarded the pleural suture in what he calls the episternum (really both pleurites).

The third of the sclerites is not so easily accounted for. Judging from its position behind the peritreme it can hardly be prothoracic. It is quite evident that it is an accessory sclerite, but its homology in other insects is not certain at present. Stough does not show this in his figures, although it is present in all the species that I examined, including *Pachypsylla*, with which he worked.

Mesothorax.—The mesothorax is the largest part of the thorax, being both long and broad and well adapted for muscle attachment. The præscutum (often called the *dorsulum*) is always as long as the pronotum and very often much longer. The anterior edge is somewhat flexed upward to hook into the posterior margin of the pronotum. The lateral margin is not so low as that of the pronotum, but a long, narrow process extends from this margin down and a little backward to the mesepisternum, articulating with the latter somewhat below the wing base. In many species, notably *Apsylla cistellala* (fig. 2), there seems to be a suture dividing this process at its base from the præscutum. Whether this is a true suture or only an internal ridge is difficult to state. It seems more reasonable that it is only a ridge and that the part in question is a real process and not a distinct sclerite.

The *scutum,* sometimes spoken of as the mesonotum, is a large and heavy sclerite. It is separated from the præscutum and scutellum by prominent furrows externally and ridges internally. There is a strong articulation between this and the episternum near the wing base and epimeron behind the wing base.

Between the lateral process of the præscutum and the anterior margin of the scutum and the wing base are two tuberculous sclerites, the anterior one being often large and very conspicuous. These are evidently the paraptera, which in most other insects are simple sclerites and not knob-like or tuberculous. Behind the wing base and near the end of the axillary cord is a third parapteron, but this is not swollen as the others are.

The *scutellum* is very much smaller than the scutum and is hemispherical in shape with a long slender axillary cord extending down laterad from it to the wing base and forming part of the latter.

The *postscutellum,* or pseudonotum of Verhoeff and Snodgrass,[1] is a very short sclerite behind the scutellum and extends down laterad beneath the axillary cord in the basal portion and then behind it from there on, articulating at its apex with the epimeron.

The *mesopleurites* are very large and extensive, forming a large part of the entire pleural region. The wing base is a large bifurcate process, with the axillary cord usually fused with it and forming part of the attachment base for the anal angle of the wing.

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[1] Snodgrass's The Thorax of Insects and the Articulation of the Wings (Proc. U. S. Nat. Mus., '36: 511–595, 1909), has been used continually in these interpretations of the thoracic sclerites.

The *pleural suture* is distinct from the coxa to about the middle of the pleura, but from the wing process downward to this point it is usually either obsolete or very indistinct. In *Apsylla,* however, and also *Livia* and *Euphyllura* and perhaps other genera the suture may be traced to the base of the wing process, its course being rather tortuous. A little above the coxæ may be seen the lateral apodemes of the mesopleuræ, as invaginations on the pleural suture. The lower end of this suture is at the articulatory condyle of the mesocoxa and usually meets the margin of the episternum at the same point.

The *episternum* is somewhat larger than the epimeron and has a long line of articulation with the mesosternum in front of the coxa. The epimeron articulates above with the postscutellum and also with the scutum and below with the coxa. Below the wing base in many species is a more thinly chitinized and impressed area of irregular outline.

The *mesosternum* also is very large and extensive, forming even more of the sternum relatively than the mesonotum does of the entire thoracic dorsum. It extends forward to the forecoxæ and is flexed upward at this point with the anterior margin arcuate inward to allow for the labium which passes out behind the forecoxæ. From near the posterior margin, between the mesocoxæ, arise the mesofurcæ. These are a little larger than the profurcæ, and the end of each arm is broadened out T-shaped to facilitate muscle attachment. A narrow prolongation of the sternum extends back between the coxæ, but not beyond this point.

Metathorax.—The metathorax presents more remarkable developments and specializations than any other part of the body. This is especially true of the pleuræ and the endoskeleton and has been caused by the habit of leaping which has necessitated unusually strong attachments for the relatively gigantic muscles found in the thorax of these insects.

The *metanotum* is much smaller and less conspicuous than the mesonotum. The praescutum of the metanotum is almost or completely suppressed. The scutum forms the largest part of the notum and articulates with the wing process of the hind wings. The scutellum is similar in shape and appearance to the mesoscutellum, but is usually smaller. An axillary cord extends down from it to the wing process, as in the mesothorax, and forms the point of attachment for the anal angle of the hind wing.

The postscutellum, or pseudonotum, is much larger than that of the mesothorax, and is very often produced into a pair of horn-like processes or very prominent ridges. It extends down laterad and articulates with the epimeron.

The *metapleuræ* have been very much changed from their original simple condition and show complications which are difficult to understand without a more generalized form, as *Apsylla,* to compare with. In the more highly specialized species (which include nearly all) the metacoxæ have become enormously enlarged and have pushed far up into the pleural region nearly up to the tergum and have displaced the pleurites from their normal position. A careful examination of *Apsylla* (figs. 2, 9, 12) first will aid greatly in interpreting the sclerites and sutures in the other species.

The *pleural suture* is distinct in *Apsylla,* extending from the wing process to the articulatory condyle of the metacoxa at the uppermost point of the latter. The metacoxa is not much larger than the mesocoxa and does not extend very far upward. The episternum is much larger than the epimeron and bears the metathoracic spiracle near its anterior margin. This is not a distinct sclerite, peritreme, as it is in the other species, but the chitin between the spiracle and the part of the episterum posterior to the spiracle is thinner. The episternum articulates on its lower margin with the small metasternum, which is a small, narrow sclerite between the meta- and mesocoxæ. A rather large trochantin articulates with the rest of the lower margin of the episternum and with the sternum.

The *epimerom* is broad above, articulating with the postscutellum on its posterior corner. A thickened ridge passes down its posterior edge to the articulatory condyle of the coxa, and at this point the epimeron, still thickened, is flexed backward and passes down behind the coxa. Here it turns inward and unites with the corresponding prolongation of the epimeron of the other side, and together they fuse with the end of the metasterum, which is described below.

The *metacoxa* is more or less cordate and not very much larger than the mesocoxa. By reflected light it appears to be uniformly thick throughout, but by transmitted light, when the specimen has been well cleared, a distinct thickening along the posterior edge is easily visible. This thickened ridge becomes broader below. From near the coxal cavity, caudad, there projects a thick spiniform process, the *meracanthus* or *coxal spur.* This appears to be articulated and is not a true process.

In the more highly specialized species the metacoxa, as already stated, has become very enormously enlarged and has pushed far up into the pleura. A comparison of *Apsylla* (fig. 2) and *Psylla alni americana* (fig. 4) shows very plainly that this pushing upward of the coxa has been between the pleural suture and the posterior thickened ridge of the epimeron. As a consequence, the pleural suture in *Psylla* does not extend to the upper end of the coxa, but terminates in front of and below that point. The lower extremity of the episterum articulates with the sternum, which is even smaller and more reduced than in *Apsylla.* The trochantin is larger and articulates with the coxa in front and well below the upper end. Along this margin of the episternum next to the trochantin inside there is a ridge, which extends upward along the corresponding margin of the epimeron and articulates with the coxa at its uppermost point and passes on downward behind the coxa to unite with the corresponding process from the other side and with the sternum, as described for *Apsylla.*

The metacoxa is similar to that of *Apsylla,* except that it is much larger and the posterior thickening is more marked and conspicuous, while the anterior part is thinner. Stough went widely astray in his interpretation of the metathorax. The thickened posterior part of the metacoxa he called the epimeron and the remainder he called the coxa. The pleurites he did not attempt to explain or show, except his supposed epimeron.

The *sternum* of the metathorax is, in the generalized *Apsylla,* rather similar to that of the mesothorax, but much smaller. It is a narrow, though easily visible, sclerite between the meso- and metacoxæ with a narrow projection extending back between the metacoxæ and mostly covered by them so that it is scarcely visible from directly beneath. This narrow process articulates with the two prolongations from the two epimera which project downward behind the coxæ.

The *metafurcæ* arise from the posterior part of the sternum ventrad, near the point from where the posterior prolongation begins. They are about one-half larger than the mesofurcæ and of similar shape and form, except that the apices are more flattened out and broadened (fig. 12). The lateral apodemes are small but distinct, and show plainly the position of the pleural suture (figs. 2, 12).

In *Psylla,* and practically all the genera except *Apsylla,* the sternum and metafurcæ are very much more complicated. The sternum is scarcely visible from beneath, except a small sclerite at the lower end of each metepisternum. This extends upward (shown in fig. 1 by dotted lines) between the meso- and metacoxæ, and is visible only by dissection, being concealed by the coxæ (figs. 10, 11). The posterior prolongation is, therefore, a little farther up from the venter and is larger and longer because the metacoxæ are larger and it must reach to the posterior margin of the latter. At the posterior margin of the coxæ the sternum articulates with the prolongations of the epimera in exactly the same manner as in *Apsylla.*

The metafurcæ are not simple and small, as in *Apsylla,* but are exceedingly long and complicated (figs. 10, 11) in their structure and articulations with the other parts of the body. The two main forks of the furcæ pass upward arcuately to the dorsum of the metathorax and extend backward to beyond the posterior margin of the postscutellum, projecting into the base of the abdomen. About half way between the fork and the apex is an arcuate transverse process connecting the two arms of the furcæ; extending from each arm a little further distad is a process connecting with the post-coxal prolongation of the epimeron; another, a little more proximal of the latter process, unites with the ridge on the internal side of the margin of the epimeron and episternum in front of the coxa (figs. 1, 10, 11). This is the form in several species of *Psylla*. In other genera there are minor differences, but the principal features of the endo- and exoskeleton are the same.

The musculature of the thorax, and especially of the metathorax, is very remarkable and interesting, but it will not be discussed here. It scarcely needs to be said that these peculiar developments of the metafurcæ and metasternum are for muscle attachment.

APPENDAGES OF THE THORAX.

Wings (fig. 395).—The wings, four in number, are membranous, though sometimes the anterior pair is thickened and leathery. The shape is variable from elongate-ovate to rhomboidal. The venation is simple, and presents relatively few striking differences throughout the family.

The media and cubitus have fused at the base with the radius, and only one principal basal vein is present (R+M+Cu). This divides near the base into either three (Triozinæ) or two veins. In the latter case the posterior of the two veins (M+Cu, or the *cubital petiole*) divides again into the media and cubitus. The upper fork, radius (R), gives off the radial sector (Rs) about midway in its course to the costa (C). The radius may unite with the costa directly or it may turn near the costa and follow parallel with it for a distance before uniting with it. The space between the costa and radius, in the latter case, is called the *pterostigma*. The radial sector passes to the apical portion of the wing and is branched only in exceptional cases.

The medial vein is branched once near its apex, forming M_{1+2} and M_3, and the cell thus formed is called the *second marginal cell*. The cubitus, also, forks once into Cu_1 and Cu_2, forming the first *marginal cell*. The claval suture dividing the clavus and corium is near the base, extending from the base to near the tip of Cu_2. Only one anal vein is present, and that is very short and near the base. The veins, and sometimes the membrane, are beset with fine or coarse hairs.

The venation of the posterior wings is even more simple, the wings themselves being much smaller and more delicate in texture. R_1 is wanting, the first vein behind the costa being the radial sector. The media is unforked at the end. The cubitus divides, as in the primary wing, into Cu_1 and Cu_2. A short anal vein is sometimes present.

Legs.—The coxæ are large and subglobose or ovoid, the metacoxæ being very much larger and more complicated in their structure (see discussion of the metapleuræ above). The fore- and metacoxæ are usually contiguous, while the middle pair are not.

The trochanter is freely movable in the acetabulum of the coxa. The femur is long and large, and the hind pair are well supplied with muscles for springing. The tibia is as long as or longer than the femur and relatively slender. In many genera there is a spur at the base, and in all the genera there are from three to many black spines at the apex.

The tarsi are two-segmented. The apical segment bears two large sharp claws with a long seta between them. The basal segment in most genera, except Triozinæ, bears two large claw-like spines at the apex, one extending out on each side of the distal segment.

ABDOMEN.

Figs. 1, 8, 13–14.

The number of segments in the abdomen is reduced below the number in the typical or generalized insect. There are five easily visible segments besides the genital segment in the female and six plus the genital segment in the male. In addition to this there are several segments reduced or suppressed and several represented by the gonapophyses in both sexes. The total number has been said by Witlaczil and others to be ten, while Heymons [1] shows eleven to be the total number in the several genera of Homoptera, though Psyllidæ are not explicitly included. I find that the latter, eleven, is correct.

The first segment has been said to be fused with the metathorax as a propodium. This is not possible according to the position of the first spiracle. Stough ('10:151) states that there are seven spiracles on the abdomen. In *Psylla pyricola* (figs. 13, 14) and in all of the other species which I have examined there are eight in both sexes. Two are between the metathorax and first tergite. The latter is much reduced and is not the first of the large tergites. There are two very small chitinized sclerites below these and before the first large urite. It is obvious that these are two atrophied urites and represent two suppressed abdominal segments. The tergites of the first two seem to be wanting entirely, while that of the third is present as a reduced sclerite. The fourth to eighth tergites, inclusive, are distinct enough. The ninth segment in the female is represented by the ventral valve of the genital segment. The tenth is represented by the ovipositor sheath within the genital segment and the eleventh segment by the dorsal or anal valve of the same genital segment. The eighth urite is suppressed. In the male the segments are similar up to the ninth. The ninth tergite is suppressed

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[1] Heymons, R. Beiträge zur Morphologie und Entwickelungsgeschichte der Rhynchoten, 1899.

but the urite is well developed. The tenth segment is represented by the ventral genital valve, bearing the forceps on its upper margin. The eleventh segment is the *anal valve*, the dorsal sclerite bearing the anal opening at its extremity. The term supra-anal plate applied by some to this sclerite is hardly correct, for it is not above the anus, as the term implies, but bears the anus; hence the term *anal valve*.

The spiracles are quite dependable for the interpretation of the abdominal segments, and it seems obvious that the above statements are correct. However, the best and surest method of determining the actual number of the segments is by embriological studies. Until such studies are made the conclusions can not be absolutely certain.

LOCOMOTION.

The Psyllids are usually very active little creatures and often difficult to catch without the aid of a net. The rapid movement is a combination of leaping and flying. When disturbed a psyllid throws itself into the air by means of its powerful hind legs, and once in the air it vibrates its wings and thus increases the rapidity of movement and the distance covered. The wings are scarcely strong enough to permit of rapid or prolonged flight unaided by the preliminary leap. By this combined leaping and flying, however, the insect is able to travel several yards, although more often it merely leaps a few inches or feet from the point of disturbance.

The hind legs are much larger and longer and more muscular than the others. The femur is directed backward, the tibia bends forward and the tarsi backward. For leaping, the insect doubles the tibiæ close up under the femora and the tarsi close under the tibiæ, and fastened firmly by means of the claws. The tarsi are so short that the claws are nearly under the trochanter, when the leg is doubled for leaping. By suddenly extending the tibiæ by means of the powerful muscles in the femora and coxæ the body is thrown upward and forward. This may be most easily understood if one folds a piece of paper in the form of a Z with the base short, and performs the motions described above.

RELATIONS TO OTHER HOMOPTERA.

It seems apparent from the morphological studies on this family that it is less closely related to the Aphididæ, Aleyrodidæ, and Coccidæ than has been heretofore supposed. Many things point to a close relationship with the higher Homoptera, especially the Cicadoidea, and the Membracidæ, and related families. The writer is not yet prepared to make any definite statement in this regard. It is to be hoped that more work will be done in the future with a view to establishing the true relationships between the families of Homoptera. The sclerites of the head and thorax, the number of abdominal segments present and suppressed, many features of the internal anatomy, the form of the gonapophyses and many other things indicate a much closer relationship with the higher Homoptera than has been generally supposed.

COLLECTING AND PRESERVING.

The Psyllidæ, like most Homoptera, are to be found on trees or smaller plants, sucking up the plant juices by means of the long beak. They may be collected with a sweep net, or with tweezers if the insects are not too active—as they often are. The external skeleton is hard enough so that the insect will retain its form after drying. For this reason they may be killed in a cyanide bottle and preserved on paper triangles or minuten nadeln. Or, they may be placed in 70 per cent alcohol and preserved indefinitely in this way. Specimens may be sent by mail, also, in either manner.

If possible, all stages of the insect, nymphs as well as imagines, should be preserved. The nymphs are best preserved in 70 per cent alcohol. As much data as possible regarding the host-plant, time of year, locality, elevation, etc., should be secured and should accompany the insect either by means of lot numbers or else on the pin or in the vial of alcohol.

Specimens for study should be mounted on a paper triangle or minuten nadeln, and not mounted in balsam. The shape and natural form of much of the body surface is not readily visible, because of distortion, in balsam mounts. The finer details of the genitalia, however, are best seen by clearing and mounting the cauda in balsam.

DETERMINATIONS FROM IMMATURE STAGES.

Determination of the species when only the nymphal form is available is quite impossible at present. No serious attempt has been made thus far to work out a system of classification based on nymphs only. As soon as sufficient material for this work becomes available, the writer expects to undertake such a task. At present, however, the best that can be done is to determine, sometimes, the subfamily to which the nymphs belong.

In general, the nymph possesses a flattened oval body, with the long beak on the ventral surface near the center. There are usually three or four instars. After the first molt the wing pads become visible on the anterior half of the dorsal side. The body is often covered or fringed with variously shaped hairs.

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EXPLANATION OF DESCRIPTIONS.

Since the two sexes differ very little in this family, except in the genitalia, one description is given for both the male and female of each species, followed by a description of the genitalia first of the male, then of the female. If any other secondary differences between the sexes do occur, these are noted in the general description.

SYSTEMATIC TREATMENT.

SYNOPSIS OF THE SUBFAMILIES.

*a*¹. Head deeply cleft in front, with the antennæ attached to the truncate anterior ends on each side of cleft (see fig. 122); genæ seldom produced into conical processes; furcation of media not dichotomous (see figs. 395 and 492); hind tibiæ often with a spur at base.......................................CARSIDARINÆ.

*a*². Head not as above (head may appear to be cleft, but this is due to the genal cones, and the antennæ are not attached to the ends of these).

  *b*¹. Frons not covered by genæ; genæ not produced into conical processes (except in *Calophya*); front ocellus at extremity of frons.

    *c*¹. Vertex flat and horizontal, with frons beneath it in the form of a narrow (usually elongate) sclerite from clypeus to front ocellus; wings often more or less thickened and maculated.......................................LIVIINÆ.

    *c*². Vertex rounded downward in front, not horizontal, with frons as a distinct sclerite usually forming a uniformly smooth surface with vertex and genæ; wings usually membranous.......................................PAUROPSYLLINÆ.

  *b*². Frons covered by genæ; genæ usually produced into conical processes (genal cones); front ocellus imbedded between vertex and genæ.

    *c*¹. Forewing with more than the usual two marginal cells, the additional ones (or one) being formed by the branching of the radial sector or a cross vein from same to media.......................................CERIACREMINÆ.

    *c*². Forewing with only the usual two marginal cells, formed by furcation of media and cubitus; radial sector not branched and without cross vein to media.

      *d*¹. Basal tarsal segment of hind legs without a pair of black, claw-like spines at tip; radius, media and cubitus usually diverging at same point from basal vein; wings usually angulate at apex.......................................TRIOZINÆ.

      *d*². Basal tarsal segment of hind legs with two black, claw-like spines at tip; the three veins not diverging at same point from basal vein, but media and cubitus with a common stem (cubital petiole); wings rarely angulate at apex.......................................PSYLLINÆ.

Subfamily LIVIINÆ.

This subfamily is characterized chiefly by the flattened head, the inferior position and the shape of the frons, the form of the genæ, the short antennæ and more or less thickened wings.

Head flat, not deflexed; vertex longer or shorter than broad; frons beneath vertex, not covered by genæ, visible as a narrow (usually elongate) sclerite from clypeus to front ocellus; genæ more or less swollen beneath vertex, never conical. Antennæ usually short, rather thick. Eyes compressed (Liviini), or bulging more conspicuously (Aphalarini). Thorax scarcely arched; sutures not deeply impressed. Wings more or less thickened, variable in shape and venation.

SYNOPSIS OF GENERA.

a^1. Eyes greatly flattened, not hemispherical; vertex longer than broad; pronotum extending far down laterad toward coxæ; wings thickened........Tribe *Liviini*.
One genus............*Livia* Latreille.

a^2. Eyes more or less hemispherical; vertex not longer than broad..Tribe *Aphalarini*.
  b^1. Pronotum extending down laterad to below lower surface of eyes; vertex about as long as broad; genæ not swollen; wings thickened........*Rhinocola* Förster.
  b^2. Pronotum not extending down laterad as far as lower surface of eyes, shorter with a knob-like lateral termination; vextex broader than long; genæ somewhat swollen.
    c^1. Vertex flat, more than half as long as broad; genæ only slightly swollen; wings usually ovate, hyaline, often maculated; male anal valve with a long posterior horizontal lobe...................................*Aphalara* Förster.
    c^2. Vertex shorter, not as flat as in above genus; genæ more swollen but not covering frons; wings more or less thickened and rhomboidal; male anal valve not as above...................................*Aphalaroida* new genus.

Tribe LIVIINI.

Genus LIVIA Latreille.

Head not deflexed, as broad as prothorax and closely joined to it; vertex flat, usually longer than broad, more or less rectangular in outline, apical portion thin; frons not covered by genæ, visible as an elongate sclerite beneath vertex from clypeus to front ocellus; genæ somewhat swollen, never produced into cones; eyes greatly flattened, scarcely bulging from head, with a small tubercle (preocular tubercle) in front of each; anterior ocellus beneath, not visible from above. Antennæ short, basal segments unusually large. Thorax flat; pronotum extending far down laterad nearly to coxæ; propleurites very small. Legs short. Wings thick, often maculate, or rhomboidal.

Type of genus.—*Livia juncorum* Latreille. This species was designated as the type by Latreille in 1810 ('**10**: 265).

SYNOPSIS OF SPECIES.

a^1. Wings maculated, relativeiy broad.
  b. Wings rather small, rhomboidal or rectangular; M strongly arched; Rs sinuate; vertex short; segment II of antennæ short.........*coloradensis*, new species.
  b^2. Wings rather large, broadly ovate, not squarish; M almost straight; second marginal cell much larger than first.

c^1. Wings rather dark, with subapical whitish band before the apical dark band; veins abundantly spotted with dark brown; first marginal cell mostly clear; vertex broadly and usually deeply emarginate in front; segment II of antennæ more than one-third as long as flagellum.......*maculipennis* Fitch.

c^2. Wings lighter, unicolored to apical brown band; latter lighter than in above species; first marginal cell brown; veins without spots; vertex longer, as in *vernalis*, less emarginate in front; segment II of antennæ less than one-third as long as flagellum....................................*marginata* Patch.

a^2. Wings not maculated, yellowish brown, thick and transversely wrinkled, relatively not so broad.

b^1. Body, with wings, seldom less than 4 mm. in length; vertex large, deeply emarginate in front, protruding to nearly midpoint of second antennal segment, sometimes less, sometimes raised on margins; flagellum of antennæ usually three to four times as long as segment II; forceps of male long, constricted midway and more or less pyriform; forewings thick, nearly opaque..*vernalis* Fitch.

b^2. Length seldom more than 3 mm., often less; vertex smaller, protruding less over antennæ, not deeply emarginate in front, scarcely raised on margins; flagellum of antennæ usually about two and a half times as long as segment II; forceps of male usually short, stout, not pyriform, truncate at apex, more pubescent, especially at apex; forewings thinner, semitransparent.....*caricis*, new species.

LIVIA COLORADENSIS, new species.

Figs. 20, 27, 33, 222, 275, 426.

Length of body 2.4 mm.; length of forewing 2.4; width of head 0.80; length of vertex, 0.55. General color brown to dark brown, darker on abdomen than on thorax and head. Body robust, moderately small.

Head relatively short, not longer than width between eyes; occipital margin but slightly arcuate; vertex coarsely vermiculo-punctate, with a broad, rounded depression on each side of median line, flat anteriorly, only slightly emarginate in front at median line and also over antennal insertions. Eyes less compressed than in *juncorum*, but slightly bulging; ocelli small. Antennæ short, stout; basal segment pedicellate; II not much longer than I; flagellum stout, about three and a half times as long as II; terminal setæ long.

Thorax flat, coarsely punctate, more so on pronotum than on rest of notum. Pronotum about as long as præscutum, sometimes slightly shorter; margin of lateral extremity even with face. Wings subrectangular, about one and a half times as long as broad, rather square apically, coriaceous, conspicuously maculated; apical fourth darkly spotted and maculated, the rest with fewer and more scattered spots; veins with numerous black spots at regular intervals; second marginal cell broad, larger than first.

Genitalia.—*Male.*—Genital segment small, rounded; forceps small, scarcely arched, narrowly acute at apex; anal valve large, long, broad, longer than forceps, square at tip, sides subparallel. *Female.*—Abdomen very stout; genital segment not quite as long as rest of abdomen; dorsal valve longer than ventral, equally acute.

Described from one male and three females from Colorado (C. F. Baker), and one female from Texarkana, Arkansas (E. S. Tucker). This species is apparently related to *maculipennis* Fitch, an eastern species; the wing venation is quite similar, but the size is markedly different. In the characters of the head and thorax the two species are quite distinct.

Type-specimen in author's collection.

LIVIA MACULIPENNIS Fitch.

Figs. 25, 425.

Diraphia maculipennis Fitch ’57: 740.—Thomas ’79: 14.
Livia maculipennis Riley ’83: 68.—Patch ’12a: 7.
Livia bifasciata Provancher ’86: 307.

Length of body 2.8 mm.; length of forewing 2.9; width of head 0.84. General color brown to dark brown. Body rather large.

Head rather long, about as long as width including only one eye, as broad as prothorax; vertex long, quite deeply emarginate in front at median line, very coarsely vermiculo-punctate, ascending posteriorly and outwardly toward posterior ocelli, front margin rough and broken; eyes very compressed, large. Antennæ relatively longer than in preceding species, second segment very large and long, one-half as long as flagellum; two apical segments black; terminal setæ long.

Pronotum slightly longer than præscutum, somewhat constricted dorsad. Præscutum small. Wings large, coriaceous, maculated, broadly ovate and broadly rounded at apex, about one and two-third times as long as broad; second marginal cell much larger than first; pterostigma large; with a dark band across wing distad, then a light almost hyaline band subapically about as broad as the apical band; basal half yellowish brown except clavus rather hyaline; light portions with conspicuous brown spots situated mostly on veins.

Genitalia.—*Male.*—Genitalia similar to *coloradensis*. *Female.*—Abdomen large; genital segment about as long as rest of abdomen; dorsal valve longer than ventral, slightly sinuate caudad.

Described from 17 males and females from Washington, District of Columbia (E. A. Schwarz), on "swampy meadows," May, 1880; 7 from Eufaula, Alabama (Schwarz), on Pine; 1 from Holderness, New Hampshire (Hubbard and Schwarz); 12 marked "U.S.D.A., 4783, Sept. 29, 1910;" 2 collected by Uhler (locality unknown); 4 from Hamburg, New York (van Duzee), July; 1 from Pennsylvania (C. F. Baker).

LIVIA MARGINATA Patch.

Livia marginata Patch 12a:8.

This species is closely related to *maculipennis*, but in a few characters seems to be distinct. The size is about the same. The vertex is longer and bears considerable resemblance to that of *vernalis*, being less broadly emarginate in front; antennal segment II relatively smaller and shorter, less than one-third the length of flagellum. The forewings are similar in shape, but lack the spots on the veins and are lighter colored, with the apical brown band lighter and extending over first marginal cell. The genitalia are similar. The mesonotum is conspicuously darker than in *maculipennis*, appearing as a brown spot on the dorsum.

Described from two females from Holderness, New Hampshire, collected by Hubbard and Schwarz at the same time apparently as the one specimen of *maculipennis* from this same locality. The type locality is Colebrook, Connecticut (H. L. Viereck), one male described by Miss Patch.

LIVIA VERNALIS Fitch.

Figs. 3, 24, 26, 217, 270, 423.

Livia vernalis Fitch **51**:64.—Thomas **79**:14.—Riley **83**:68.—Packard **90**:803.—Lintner **93**:404, 411.—Patch **12a**:7.
Diraphia femoralis Fitch **57**:740.—Riley **83**:68.
Livia femoralis Lintner **93**:404, 411.
Diraphia calamorum Fitch **57**:740.—Riley **83**:68.
Livia saltatrix Provancher **86**:307.

Length of body 2.8 mm; length of forewing 2.9; width of head 0.81; length of vertex 0.76. General color orange to light brown, sternum and face dark, abdomen lighter; antennæ black at tip. Body large.

Head long, as broad as prothorax; vertex large, sides nearly straight, as long as width including only one eye, rather deeply emarginate in front of median line, margins more or less upturned, produced in front to nearly the middle of segment II of antennæ; postocular portion large and extensive, with an oblique fossal impression across it. Eyes large, scarcely bulging. Antennæ short, II longest and largest, only a little longer than I, one-fourth as long as flagellum; flagellum short, thick, whitish except black tip; terminal setæ long.

Thorax broad, flat, coarsely punctate. Pronotum longer than præscutum, with dorsal foveæ prominent, annulated. Forewings large, very thick and coriaceous, quite opaque, yellowish brown, ovate, about twice as long as broad, broadly rounded at apex; second marginal cell larger than first, relatively broad; Rs scarcely sinuate, rather short; pterostigma long and narrow; clavus very large; distal portion of wing often with a few brownish spots visible only by transmitted light.

Genitalia.—Male.—Genital segment large; forceps large, broad at base, narrowed midway and attenuate distad, more or less asymmetrically pyriform, sparsely pubescent; anal valve large, rectangular, sides subparallel, longer than forceps. *Female.*—Genital segment about as long as rest of abdomen; dorsal valve longer than ventral, somewhat sinuate on dorsal margin.

Described from many males and females from the following localities: Agricultural College, Michigan (C. F. Baker); Ames, Iowa (C. W. Mally); New York; Washington, District of Columbia (Hubbard and Schwarz), February, March, June, and November: Maryland, February; Herndon, Virginia, in June.

LIVIA CARICIS, new species.

Figs. 28, 221, 424.

This species is in many respects very similar to *vernalis*. The size is usually distinctly smaller, sometimes very much so. The general color is similar, but often darker, sometimes almost black. The principal differences in structure are as follows: Vertex relatively shorter, usually broadest at front margin of eyes and converging anteriorly thereafter, protruding less over antennæ and protruding portion thicker, less deeply emarginate in front, not raised on margins; second antennal segment relatively longer and larger, flagellum shorter, only about two and a half times as long as II. Forewings thinner, similar in shape, usually less opaque, similar in venation, except M+Cu relatively longer, and Cu_1 shorter and more arcuate.

Genitalia.—*Male.*—Genital plate small, rounded; forceps small, stout, not pyriform nor constricted as in *vernalis*, truncate at apex, with a slight constriction just below apex, more densely pubescent; anal valve short, only slightly longer than forceps, rectangular. *Female.*—Genitalia similar in general to *vernalis*.

Described from several males and females from Boulder, Colorado, collected by E. Bethel on *Carex*, in July; many males and females from Colorado (no data); Santa Fe, New Mexico (H. S. Barber), May; Lake Tahoe, California, May, 1879; Placer County, California. (A. Koebele), September; Siskiyou County, California (Koebele); Park City, Utah (Hubbard and Schwarz), June; Bear Paw Mountain (Hubbard and Schwarz), September; Oregon (Koebele); Glacier, British Columbia (Hubbard and Schwarz); Northern Illinois; Pen Mar, Pennsylvania (Hubbard and Schwarz); Brunswick, Maine (A. S. Packard).

Type specimen in author's collection.

The differences between this and *vernalis* are somewhat inconstant, except those of the genitalia. The antennal and cephalic characters approach in similarity to such an extent that it sometimes becomes difficult to distinguish the two species on these characters alone. The differences in the male genitalia, however, seem to be constant. Miss Patch (**'12a**:7) mentions the Colorado forms of vernalis as somewhat distinct and gives to them the name of variety *a* of that species.

Most of the western individuals seem to belong to this species, while most of the eastern forms are typical *vernalis*. It is interesting to note, however, that in Pennsylvania and Maine five specimens have been taken which seem to belong to the western species. It is possible that these two species represent only one very variable species which is distributed over the entire country, and varying in the different geographical localities.

The specimens from Placer and Siskiyou Counties are a little smaller and superficially a very little different in appearance, and bear the manuscript name of *Livia subtruncata* Riley. These, however, seem to belong to the species *caricis*.

Tribe APHALARINI.

Genus RHINOCOLA Förster.

This genus is not represented in the American fauna, but it is given a place in this work because of its significance as a connecting form between *Livia* and *Aphalara*. Many of the species described in this genus are not congeneric with the type-species, *R. aceris* Linnæus, and must be referred to other genera.

An examination of *Rhinocola aceris* (figs. 29, 30, 31, 219, 273, 428) will show the many transitional characters which it possesses, intermediate between the two genera above mentioned. The head and dorsum are very slightly arched; the vertex is flat, about as long as broad; the frons and genæ resemble both genera; the antennæ are short and thickened. The pronotum is intermediate between the two genera, extending far down laterad but not as far as in *Livia*, with the pleurites shorter than in *Aphalara*, but of similar form. The wings show some peculiarities of both.

Genus APHALARA Förster.

Notum not strongly arched, often almost flat; head usually scarcely deflexed; vertex flat, more than half as long as broad, lobes somewhat rectangular but rounded in front, making an emargination between them; frons not covered by genæ, but narrow and elongate as in *Livia*, with front ocellus at its anterior end; genæ not swollen into cones, but often roundly swollen on each side of frons; clypeus pyriform, rather large. Antennæ short, never more than twice as long as width of head, often not at all longer than width of head, ten or nine segmented (usually the former).

Pronotum rather long, with two foveæ on each side, and a knob-like lateral termination; pleurites very short, quadrate; pleural suture straight, extending to middle of lateral termination of pronotum; præscutum rather short; scutum large. Hind tibiæ without spur at base, with six to nine black spines at apex; basal tarsus of hind legs with two black, claw-like spines at end, as in *Psylla* and many other genera. Wings elongate-ovate, never acute at apex, often more or less thickened and subopaque or hyaline, often maculated or spotted; M+Cu nearly always as long as R; pterostigma always wanting. Male anal valve always with a long, horizontal, posterior lobe, extending back to forceps.

Type of genus.—*Chermes calthæ* Linnæus. Foerster erected this genus in 1848, and named in it several species but indicated no type species.

The structure of the head resembles rather closely that of *Livia;* the vertex is flat, the frons similar in form, position, and appearance; genæ similar; antennæ short; notum rather flat; pronotum somewhat similar. In the hemispherical eyes, however, the two genera are quite distinct.

Since my treatment of this genus in a previous paper (Crawford **'11b:** 492) a considerable amount of additional material has come to hand, including several new species, and many new records for already described species. Several new species have been added also by Miss Patch (Patch **'11:** 16; **'12b:** 216–219), as well as some life-history records.

This genus presents serious difficulties to the systematist because of the great amount of variation in certain characters which in other genera are more or less constant. Size and color of body, shape of forewing, presence, absence or degree of maculation or coloration of latter, size of genital appendages in both sexes, are all subject to considerable variation within a species, or else there are a very large number of closely related and intergrading species.

The collection of the United States National Museum contains a very large number of specimens of this genus from many localities, and with accompanying notes and data of varying degrees of completeness. These specimens, together with those of the C. F. Baker collection, have been divided into apparent species and arranged in series of variation. In many cases the series are very long, and the variations are so gradual and complex that it is quite impossible to separate species within the series. Until accurate ecological data is available for many of these species we can not be sure of our systematic arrangement. All that can be done at present is to group these series of similar forms into provisional species. Any attempt to subdivide them would result in confusion.

SYNOPSIS OF SPECIES.

*a*¹. Antennæ ten-segmented.

  *b*¹. Clypeus much elongated, more or less cylindrical, rounded or truncate at apex, extending down and forward; notum with four more or less distinct light-colored stripes; female genital segment very short; wings hyaline to fumate, or maculated apically..*calthæ* Linnæus,

b^2. Clypeus subglobose or pyriform, not elongated, more or less appressed to face.

c^1. Forceps of male clavate, with an inwardly directed tooth on inner anterior margin subapically.

d^1. Body not very large; length to tip of folded wings distinctly less than 4 mm.

e^1. Antennæ not longer than width of head.

f^1. Wings clear, with an irregular brown band across apex diagonally; color of body reddish to flavous .... *rumicis* Mally.

f^2. Wings whitish, opaque, covered more or less densely with small round brown spots.

g^1. Head and thorax not brown or dark colored (see *pinicola*).

h^1. Color whitish; length usually about 2 mm to tip of folded wings; wings sparsely dotted........................ *artemisiæ* Förster.

h^2. Color not whitish.

i^1. Female genital segment as long as head and thorax together, with short pubescence; length to tip of folded wings usually over 2.5 mm, often 3.5 mm; color greenish yellow, with whitish stripes on thoracic dorsum; wings elongate, densely spotted............................ *angustipennis* Crawford.

i^2. Female genital segment shorter, with long hairs on distal half of dorsal valve; length to tip of wings not much over 2 mm; color greenish; wings less densely spotted, less elongate. *viridis*, new species.

g^2. Head and thorax brown, or mostly dark colored; wings rather sparsely spotted.

h^1. Thorax very strongly arched, broad, variegated with flavous and dark brown (female sometimes mostly flavous). *pinicola*, new species.

h^2. Thorax not very strongly arched, narrower; dorsal head and thorax chocolate brown, abdomen and venter flavous. *suaedæ*, new species.

e^2. Antennæ distinctly longer than width of head.

f^1. Head and thorax greenish yellow or flavous; length to tip of folded wings 3 mm or more; thorax scarcely arched.

g^1. Forewings not spotted, somewhat flavous.............. *veaziei* Patch.

g^2. Wings indistinctly and sparsely spotted.... *veaziei metzaria* Crawford.

f^2. Head and thorax darker; brown or black.

g^1. Wings clear or indistinctly spotted in apical portion; male genitalia relatively very large; color brown to black, abdomen flavous. *caudata*, new species.

g^2. Wings with an irregular oblique brown band across apex, and spotted more or less besides; male genitalia not large; color light brown to blackish, with lighter markings on thorax..... *pulchella* Crawford.

d^2. Body very large, over 4 mm long to tip of folded wings, often over 5 mm; male forceps greatly enlarged at apex; wings very large and broad.

e^1. Wings clear or indistinctly browned in apical portion, often with a slight brownish tinge over entire surface.................. *picta* Zetterstedt.

e^2. Wings similar, but with a distinct brown transverse band subapically. *fascipennis* Patch.

c^2. Male forceps not clavate at apex, without inner subapical tooth; wings maculated.

d^1. Posterior process of male anal valve tapering uniformly to apex, not lanceolate; forceps deeply bifurcate, with two long thin processes; antennæ one and a half times width of head .... *alaskensis* Ashmead.

d^2. Posterior process of male anal valve conspicuously lanceolate, petiolate at base; forceps T-shaped; antennæ one and a fourth times width of head. *nebulosa kincaidi* Ashmead.

a^2. Antennæ nine-segmented (apparently eight); body small. *Anomocera*, new subgenus.

b^1. Forewings whitish, not maculated or spotted; forceps of male serrate on apical margin, with a small inner apical tooth..............*minutissima* Crawford.

b^2. Wings with numerous brown spots; a supernumerary marginal cell often present; forceps with apical margin not serrate; inner subapical tooth on anterior margin..................................*anomala*, new species.

APHALARA CALTHÆ Linnaeus.

FIGS. 106, 161, 165, 170, 171, 377, 380, 382, 500, 504.

Chermes calthæ LINNÆUS '61: sp. 1005.

Aphalara calthæ LOEW '82: 233; '86: 149; '88: 13.—EDWARDS '96: 232.—SULC '06: 1.—OSHANIN '07: 346.—REUTER '81: 149; '08: 65.—KUWAYAMA '08: 154.—CRAWFORD '11b: 495.

A. polygoni FOERSTER '48: 80.—SCOTT '76: 561.—DOUGLAS '79: 255.—LOEW '86: 149.—MALLY '94: pl. 15.—EDWARDS '96: 232.—PATCH '11: 235; '12b: 216.

A. ulicis FOERSTER '48: 96.

Length of body 1.6 to 2.2 mm; length of wing 2.5 to 2.9; width of head 0.75 to 0.80. General color light brown to dark chocolate brown or reddish; vertex usually lighter; mesonotum with four stripes of lighter brown usually present; stripes just mentioned may be variable in degree of distinctness; abdomen darker, more or less variegated; antennæ flavous, black at tip; legs light brown to brown; wings variable in extent of maculation, from a slight fumate condition in apical portion to a more distinct brown maculation or bands; sometimes the entire wing surface is slightly fumate, with veins dark and prominent.

Head not quite as broad as thorax; vertex nearly half as long as broad, with two foveæ of varying depth and extent; genæ somewhat swollen; clypeus unusually enlarged and elongate, projecting forward and downward, cylindrical and truncate. Antennæ seldom longer than width of head (this may vary somewhat, however), rather thick.

Thorax seldom arched strongly, usually rather flat, coarsely punctate. Legs short. Wings variable in size as well as coloration, usually darker in apical half, venation as shown in figure.

Genitalia.—Male.—Anal valve moderately large; posterior lobe long, converging to apex; forceps rather short, slightly enlarged at apex, inner terminal tooth short.—*Female.*—Genital segment usually about as long as preceding ventral sclerite, sometimes longer, variable.

Described from numerous males and females from: Washington, District of Columbia (E. A. Schwarz), May 30, 1884; Massachusetts (no data); Ames, Iowa (C. W. Mally), on *Polygonum sp.*, March 1, 1885; Illinois (no data); Louisiana (C. F. Baker), no data; Wyoming (A. Koebele), June; Ogden, Utah (Koebele), on ?*Artemisia tridentata*, June 17, 1885; Park City, Salt Lake City, American Forks, and Alta, all Utah (Hubbard and Schwarz), June 15 to 30; Cañon City, Colorado (J. Gravenstock), on "cultivated tomatoes," October 15, 1884; Glenwood, Colorado (C. P. Gillette), no data; (Mesilla, New Mexico (Cockerell), August 3; Santa Fe, New Mexico (H. S. Barber), May 6; Placer County, California (Koebele), September; Alameda, California (Koebele), August 1, 1885; San Mateo, California (Baker), no data; Castle Rock, Nevada County, California (Koebele), September (doubtful specimens); Claremont, California (Baker); Oregon (Baker), no data; Washington (C. P. Gillette), no data; Acapulco, Mexico (Baker); Havana, Cuba (Baker). The distribution is wide, also, throughout Europe, many localities in Asia; Japan (Kuwayama).

The food plants are several and varied: *Polygonum*, several species; *Caltha palustris; Artemisia tridentata;* probably others, also.

It is quite possible that there are several closely related species in this large series of specimens before me, but with the present inadequate biological data it is impossible to separate them. For the present, at least, the name *calthae* will be applied to all. The variations in color, markings, size, relative proportions of parts, size of genitalia, etc., are so numerous and gradual and intergrade to such an extent that it is impossible to recognize two or three species without being required to recognize a dozen.

Aphalara polygoni of Förster was said by Loew ('82:233), to be identical with *calthæ*. Mally's *polygoni*, notwithstanding Miss Patch's statements, seems to differ from *calthæ* no more than do many other slight variants. For the present, therefore, it seems reasonable to continue to recognize the two species as identical, *polygoni* being a synonym ot *calthæ*. This conclusion is based on the examination of several of Mally's specimens and several of those studied by Miss Patch, as well as several European specimens of both species.

A. nubifera Patch ('12b:216) is very close to *calthæ* and is really not more distinct than many variants of the species. However, until more certain disposal of this variable specific group can be made, *nubifera* will not be merged into *calthæ*. In the one paratype which Miss Patch has kindly loaned to me practically the only difference there is between the two species is in the longer genital segment of the female of *nubifera*, and this character is subject to some variation in *calthæ*.

Aphalara exilis Weber and Mohr was referred (Crawford '11b: 496) to *calthæ*, with some uncertainty. Since then I have examined several additional specimens of that European species, as determined by Melichar and Reuter, and the identity of the two species seems more certain. However, since *exilis* has not been reported from America we need not concern ourselves with it at present.

APHALARA RUMICIS Mally.

Figs. 164, 384, 501.

Aphalara exilis rumicis MALLY '94:166.
A. rumicis PATCH '12b:217.
A. calthæ maculipennis CRAWFORD '11b:496.

Very similar to *calthæ*, differing chiefly in having the clypeus shorter, subglobose or pyriform as in most species, and not projecting downward. Male forceps with a tooth on anterior inner margin much farther from apex than in *calthæ*. Wings usually more decidedly colored than in *calthæ*, pattern similar.

Described from several specimens of both sexes from Ames, Iowa (C. W. Mally), on *Rumex altissimus*, March, 1895; several from St. Louis, Missouri (J. T. Monell), on *Rumex* sp., September 22, 1911 (loaned by Miss Patch). In this species are placed also for the present at least other specimens from Evanston, Wyoming (Koebele), June 15, 1885; Hood River, Oregon (Hubbard and Schwarz), May 25; Placer County, California (Koebele), Sept.; Scotia, California (H. S. Barber), May 20; Boulder, Colorado (E. Bethel), on *Sophia pinnata;* Plano, Texas (E. S. Tucker), "in corn field," June, 1907.

These latter specimens were named *A. calthæ maculipennis* Loew in a former paper (Crawford **11b**:496), and it is possible that all of these mentioned under *rumicis* belong to Loew's species. No good specimens of the latter, however, are available for comparison, and until they are it will create less confusion to designate our American forms as *rumicis*, instead of by the European name.

APHALARA ARTEMISIÆ Förster.

Aphalara artemisiæ FÖRSTER '48:96.—SCOTT '76:67; '77:283.—REUTER '81:152.—LOEW '82:232; '88:12.—SULC '06:1.—EDWARDS '08:86; (not '96:232).—KUWAYAMA '08:154.—CRAWFORD '11b:496.
Psylla malachitica DAHLBAUM '50:177.

Length of body (male) 1.3 to 1.5 mm; (female) 1.7; length to tip of folded wings usually about 2. General color whitish to very pale flavous; wings spotted. Body small.

Vertex slightly more than half as long as broad, with a large shallow depression on each side of median line; clypeus pyriform. Antennæ about as long as width of head or shorter. Thorax not strongly arched, coarsely punctate. Legs short. Wings small, not over two and a half times as long as broad, covered sparsely with small round brown spots; membrane somewhat thickened, divided by a series of fine dots into numerous cell-like divisions (visible only under high magnification), each brown spot covering one of these.

Genitalia.—Male.—Anal valve relatively rather small; forceps somewhat enlarged at apex, with a small tooth on inner anterior side subapically. *Female*.—Genital segment large, longer than rest of abdomen, dorsal valve a little longer than ventral.

Described from several males and females from American Forks, Utah (Hubbard and Schwarz), June 24; Colorado (no data); one male from Pernitz, Austria (determined by Franz Loew). Edward's *artemisiæ* ('96:232) is a totally different species, named by Oshanin ('07:344) *pilosa*.

Closely related to this species is a long series of forms which show more or less pronounced differences and many close similarities. Some of these, though not all, have been separated off and assigned to distinct species.

APHALARA ANGUSTIPENNIS Crawford.

Figs. 162, 378, 502, 503.

A. artemisiæ angustipennis CRAWFORD '11b:499.—PATCH '12b:218.

Similar to *artemisiæ*, differing as follows: Size usually larger, sometimes much larger; length to tip of folded wings varying from 2.3 to 3.5 mm. Color flavous; scutellum with several more or less distinct whitish stripes; antennæ black at tip. Wings relatively narrower and longer, usually nearly three times as long as broad, more densely covered with similar brown spots which are often crowded together so closely that they run together and form more extensive maculæ. Genitalia similar, but larger.

Described from numerous specimens from many localities: Claremont and Berkeley, California (Crawford), on *Artemisia californica*, June to September; Los Angeles, California (Coquillett), no data; Hood River, Oregon (A. Koebele), May 21; Easton, Washington (Koebele); Wasatch Mountains, Utah (Hubbard and Schwarz), June 20, 1885; Colorado (Gillette), no data; Black Hills, South Dakota (J. L. Webb), July 11; Oakland, Maryland (Hubbard and Schwarz), July 10. Some of these bear the manuscript name of *Aphalara angustipennis* Riley, and others *A. utahensis* Riley, but some of the latter seem to belong to *artemisiæ*, as described above.

Type-specimen in author's collection.

APHALARA VIRIDIS, new species.

Color greenish or greenish yellow throughout; wings rather sparsely covered with small, round, brown spots, as in *artemisiæ*, membrane thick and whitish. Female genital segment distinctly shorter than in *artemisiæ*, and with long hairs on dorsal side of dorsal valve caudad, instead of the short pubescence characteristic of the related species. Male genitalia similar to *artemisiæ*.

More closely related to *artemisiæ* than to *angustipennis*, being similar in size and general proportions to the former.

Described from several males and females from Sulphur Springs Valley, Arizona (Hubbard) May.

Type.—Cat. No. 18065, U. S. Nat. Mus.

APHALARA PINICOLA, new species.

Close to *artemisiæ*, but body much more robust; thorax broader and much more strongly arched; head narrower than thorax. Color blackish and flavous; vertex black in center of each lobe; pronotum and scutum with alternating stripes of black and flavous; præscutum black cephalad; abdomen mostly dark, variegated somewhat with flavous; antennæ black at tip. One female in the lot is mostly flavous, with much of the black faded or wanting. Wings shaped as in *artemisiæ*, sparsely spotted. Genitalia rather similar.

Described from four males and females from Argus Mountains, California (Koebele), on *Pinus monophylla*, May, 1891.

Type.—Cat. No. 18066, U. S. Nat. Mus.

APHALARA SUAEDÆ, new species.

Fig. 110.

Close to *artemisiæ*, differing as follows: Color of vertex and thoracic dorsum reddish brown to chocolate brown, abdomen, venter, legs, and antennæ light yellow. Thorax rather flat, not arched as in *pinicola*, and rather narrow, finely punctate. Vertex relatively larger. Wings narrower in apical portion, more densely spotted. Genitalia similar.

Described from several males and females from Death Valley, California (Koebele), April, 1891; Las Cruces, New Mexico (Cockerell), on *Suaeda hiemalis*, November 13, 1893; several in National Museum collection with data "4395," and no more, these bear the *nomen nudum*, *A. suedæ* Riley).

Type.—Cat. No. 18067, U. S. Nat. Mus.

APHALARA VEAZIEI Patch.

Figs. 18, 163, 172, 386, 505.

A. veaziei Patch '11 : 16.
A. communis Crawford '11b : 499.—Patch '12b : 218.

Length of body 2 to 2.7 mm.; length of forewing 2.7 to 3.1: width of head 0.80 to 0.87 m. General color greenish yellow Body variable from rather small to large, but not as large as *picta*.

Head moderately broad, not quite as broad as thorax, not deflexed; vertex a little more than half as long as broad, with two shallow foveal depressions; clypeus pyriform. Antennæ longer than width of head, some times as much as one and a half times as long.

Thorax almost flat, less arched than usual, finely punctate. Legs moderately long. Wings about two and three-fourths times as long as broad, clear or slightly flavous, more or less transparent, rarely with faint indications of spotting; venation typical.

Genitalia.—*Male.*—Anal valve of usual form, rather large; forceps somewhat similar to those of *artemisiæ*, but more enlarged at apex, with subapical inner tooth larger and more prominent. *Female.*—Genital segment large, longer than rest of abdomen, or as long, dorsal valve longer than ventral and less acute.

Described from numerous specimens from the following localities: Washington, District of Columbia (E. A. Schwarz), May 11, July; Virginia, May 15, 1881 (cabinet name, *Aphalara solidaginis* Riley); Oakland, Maryland (Hubbard and Schwarz), July 10; Fort Pendleton, West Virginia (Hubbard and Schwarz), July 10; Dows Lake, Ottawa, Ontario, Canada (W. Metcalfe), May 27, 1903; Nebraska (Bruner), no data; Black Hills, South Dakota (J. L. Weber), June 24; Polk County, Wisconsin (C. F. Baker); Banner, Wyoming (C. W. Metz), August, 1910; American Forks, Utah (Hubbard and Schwarz), June 22; Easton, Washington (Koebele); Argus Mountains, California (Koebele), May, 1891; Ormsby County, Nevada (Baker); Flagstaff, Arizona (Barber and Schwarz), "4–7;" Pagosa Springs, Colorado (Baker).

This is another very variable and widely distributed species, and one as difficult to define as *calthæ* and *artemisiæ*. The variations in size of body, size and shape of forewing, length of female genital segment, and minor variations in wing venation may represent several closely allied species, or one variable and elastic species. If the former is true it is impossible to attempt to separate the species with our limited ecological data.

The description of *A. communis* Crawford was in press when Miss Patch's description of *veaziei* appeared. A comparison of a paratype of her species with *communis* shows that the two are identical, so far at least as we are able to determine now.

The structure of the male forceps is not very distinctive of this species. The same type of forceps is possessed by *A. picta*, and other species also.

APHALARA VEAZIEI METZARIA Crawford.

A. communis metzaria CRAWFORD '11b: 499.

This varietal name was given to several individuals with the wings spotted more or less indistinctly (never darkly) in the apical portion. It is possible that this character is not of varietal value, but for the present it may remain.

Described from several males and females from Sheridan, Wyoming (C. W. Metz); Pagosa Springs, Colorado (C. F. Baker); Los Angeles, California (Koebele); Beeville, Texas (Hubbard and Schwarz), on *Aster*, November.

Type in author's collection.

APHALARA CAUDATA, new species.

Resembling *suaedæ* in color and size; head similar, but antennæ distinctly longer than width of head. Vertex and thoracic dorsum strigate. Wings usually clear, sometimes indistinctly spotted, not thickened and marked, as in *artemisiæ*, but similar in shape and size to the latter. Male genitalia relatively very large; forceps as in *veaziei*, with a large, clavate apex, and a rather large subapical inner tooth.

Described from seven males and females from Los Angeles, California (Koebele), March. These bear the manuscript name of *A. koebelei* Riley.

Type.—No. 18068, U. S. Nat. Mus.

APHALARA PULCHELLA Crawford.

Figs. 107, 168, 176, 379, 499.

A. pulchella Crawford '11b: 500.

Length of body 1.7 to 2.2 mm.; length of forewing 2 to 2.4; length to tip of folded wings 2.3 to 3. General color brown, variegated with flavous; scutum more or less striped with flavous; antennæ pale, black at tip, and sometimes on tip of each segment.

Head not as broad as thorax; vertex conspicuously emarginate on front margin, coarsely strigate; antennæ about one and a half times as long as width of head, slender. Thorax rather strongly arched, broader than in *caudata*, strigate. Legs slender. Wings rather narrow, more attenuate at base than usual, broad distally, almost half as broad as long, clear and semitransparent except on the brown maculæ; wing picture as in figure.

Genitalia.—*Male.*—Genitalia rather large; anal valve of usual form for this genus; forceps as in *caudata*, enlarged at apex. *Female.*—Genital segment as in *veaziei*, longer than rest of abdomen, rather slender, acute at apex.

Described from several males and females from California, as follows: Claremont (C. F. Baker); San Mateo County (Baker); Los Angeles (Coquillett). The latter bear the manuscript name of *A. coquilletti* Riley.

Type in author's collection.

APHALARA PICTA Zetterstedt.

Figs. 166, 173, 383, 506.

Chermes picta Zetterstedt '40: 308.

Aphalara picta Flor '61: 539.—Scott '76: 563.—Loew '76: pl. 2, figs. 36–40; '77: 124; '79: 562; '82: 256; '86: 150; '88: 13.—Reuter '81: 151.—Edwards '96: 230.—Sulc '06: 2.—Oshanin '07: 347.—Crawford '11b: 501.—Patch '12b: 217.

A. flavipennis FOERSTER '48: 89.
A. sonchi FOERSTER '48: 96.
A. alpigena MAYER-DÜR '71: 402.
A. nervosa THOMSON, Opusc. Ent. '08: 840.

Length of body about 3.3 mm.; length to tip of folded wings 4.5 to 5.2; length of wing 4 to 4.3; width of head 0.95 to 1. General color flavous to brown; thoracic dorsum often more or less distinctly striped; abdomen darker; wings usually flavous; antennæ flavous, black at tips. Body very large.

Head much narrower than thorax; vertex more than half as long as broad, rather deeply emarginate in front at median line, coarsely punctate; antennæ a little longer than width of head.

Thorax very large, broad and strongly arched, coarsely punctate. Legs thick and stout. Wings large, broad, almost half as broad as long, more or less flavous, sometimes brownish in apical third with faint markings, somewhat transparent; first marginal cell large.

Genitalia.—Male.—Genitalia large; anal valve of usual shape, with the inferior process of the posterior lobe larger than usual; pubescence stiff; forceps very large, with a large, clavate apex and an inner subapical tooth. *Female.*—Genital segment almost or fully as long as rest of abdomen, thick at base, subacute; dorsal valve longer than ventral; pubescence stiff and prominent.

Described from several males and females from Colorado (Baker), no data; St. Louis, Missouri, May 5, 1878. Two manuscript names have been applied to these: *A. harrissii* Riley and *A. leucanthemi* (?) Fitch. These have been compared with four females from Aaken, Germany (determined by F. Loew).

The large size of the body easily distinguishes this and the following species from other American species of this genus. Some individuals, however, are smaller, not much larger than the largest of *veaziei*, but differ in having the male forceps relatively larger, the female genital segment relatively stouter, the wings more flavous, the thorax broader and more strongly arched, and the antennæ relatively shorter.

APHALARA FASCIPENNIS Patch.

A. fascipennis PATCH '12b:217.

This species is very closely related to *picta*, resembling it in size, shape, and structure of body, including the genital appendages. The chief difference is in the maculation of the forewing. A brown irregular band crosses the wing near the apex. This is a rather doubtful specific character in this genus, if we may judge from several other species previously described, but the fact that the fuscous-winged forms have been found thus far mostly in the western portion of the country, while the maculate-winged forms seem to be limited to the Northeast, seem to indicate that they may be distinct species but closely related.

The characters of the male genitalia have been taken from Miss Patch's description, since only female specimens are before me. This description has been based on four females, two from Bretton Woods, New Hampshire (van Duzee), June 30, 1909; and two from Massachusetts (Philip Uhler), bearing Harris's manuscript name of *Psylla pallida.* Miss Patch gives as localities: Ottawa, Ontario, Canada, and Tompkins County, New York.

APHALARA ALASKENSIS Ashmead.

Figs. 109, 111, 112, 132, 403.

Aphalara alaskensis ASHMEAD '10:136.

Length of body (male) 2.1 mm; length of forewing 3; width of head 0.78. General color dark brown to black, sometimes flavous (perhaps immature adults); vertex glossy black, smooth; thoracic dorsum mostly black, strigate; pronotum yellow on hind margin; pleuræ around wing bases and connexiva of abdominal segments flavous; tibiæ, basal tarsus, antennæ except tip, yellow; wings maculated brown, picture as in figure. In the two paratypes of this species from Fox Point, Alaska, the color is nearly uniformly flavous with indications of brownish markings, and the wings are indistinctly maculated, as described above. It is possible that the darker individuals represent a varietal form of the species, but it seems most probable that the Alaskan individuals were not yet fully colored.

Head large, fully as broad as thorax, scarcely deflexed; vertex very broad, smooth, glossy, broadly depressed discally on each side of median line, less emarginate over front ocellus than in *pulchella;* genæ and clypeus small; eyes very large and prominent. Antennæ very long relatively, nearly twice as long as width of head, slender.

Thorax long, somewhat arched, strigate on dorsum. Legs long, slender, especially the front pair. Wings hyaline, transparent except on the maculæ, nearly two and a half times as long as broad, broadly rounded at apex; marginal cells large, subequal.

Genitalia.—Male.—Genitalia large; forceps large, bilobate, pubescent; basal portion short and narrow, dividing into two long processes; posterior process long, arcuate, acuminate, subacute at tip: anterior process shorter, narrower, less acute, extending inward. Anal valve long, with posterior lobes long and rather large.

Described from six males, two from Fox Point, Alaska (paratypes), July, 1899, collected by Harriman-Alaska Expedition; one from Easton, Washington (Koebele); and three from Colorado (C. P. Gillette), no data.

One female of *A. schwarzii* (a paratype), from Popoff Island, Alaska (Harriman-Alaska Expedition) is colored very similarly to the darker forms of *alaskensis*. Ashmead's figure of the male genitalia of *schwarzii* is practically meaningless, and therefore I am unable to state with certainty whether or not these two species are identical. It seems probable, however, that they are at least closely related.

APHALARA NEBULOSA KINCAIDI Ashmead.

Figs. 167, 174, 175, 508.

Aphalara kincaidi Ashmead '10: 136.
A. nebulosa americana Crawford '11b: 503.—Patch '12b: 219.

Length of body (male) 1.8 mm; (female) 2.2; length of forewing 2.2 to 2.4; width of head 0.82. General color brown to blackish, with flavous markings on vertex and thoracic dorsum; wings transparent, maculated brown in apical half, as shown in figure; legs pale brown; antennæ flavous, black distally.

Head almost as broad as thorax, not deflexed; vertex large, almost flat, resembling *alaskensis*, but more emarginate in front; antennæ about one and a half times as long as width of head; clypeus smaller than in European *nebulosa* and more posterior. Thorax rather flat, not very broad, strigate. Wings about two and a half times as long as broad, rather transparent, maculated, venation as usual in genus.

Genitalia.—*Male.*—Posterior lobe of anal valve not as in other species of genus, but conspicuously lanceolate with a petiolate base, and a ridged "midrib" in basal portion; forceps moderately long, constricted subapically, and apex abruptly broadened out, T-shaped, with anterior part of apex longer than posterior. *Female.*—Genital segment rather long, but not as long as rest of abdomen; dorsal valve longer than ventral.

Described from one male (paratype of *A. kincaidi*), from Popoff Island, Alaska, July 9, 1899, collected by the Harriman-Alaska Expedition; many males and females from Easton, Washington (Koebele); Fieldbrook, California (H. S. Barber), May 19, 1903; Colorado (no data). Manuscript name: *Aphalara epilobii* Riley.

The American variety differs from the European form as follows: Clypeus smaller and situated farther back; male forceps larger, with apical transverse part almost as long as vertical portion, while in the other it is only a little over half as long; wing picture lighter in color.

ANOMOCERA, new subgenus.

Although a reduction in the number of antennal segments in Psyllidæ is apparently a striking character, judging from the small number of species which show this character, yet this alone may not warrant the erection of a new genus. Two species of *Aphalara* with the antennal segments distinctly reduced are so similar to other species of the genus in nearly every other respect that it seems advisable to regard them as forming a subgeneric group within the genus *Aphalara*. Because of this antennal reduction the name *Anomocera* is given to the subgenus.

The antennæ are short, but not unusually so. The reduction seems to have occurred in the apical segments. The two basal segments are normally enlarged; the third is longest and the succeeding segments subequal to each other. What appears to be the terminal, (eighth) segment is really composed of two short closely connate segments, thus making the antennæ nine-segmented, but apparently only eight-segmented. Other characters are more or less similar to the *holocerous* species.

Type of subgenus.—*Aphalara* (*Anomocera*) *minutissima* Crawford.

APHALARA (ANOMOCERA) MINUTISSIMA Crawford.

Figs. 169, 177, 381, 507.

Aphalara minutissima CRAWFORD '11b: 500.

Similar in size and general gross appearance to *artemisiæ*, differing as follows: Color a little more whitish; wings white, not spotted; antennæ of about the same relative length but only nine-segmented, with the terminal two segments so closely connate that they appear as one segment except by close examination. Thorax usually less arched, coarsely punctate. Wings more narrowed apically, thick, whitish, not spotted or maculated, venation as usual for genus; sometimes slightly brownish toward apex.

Genitalia.—*Male.*—Genitalia similar, but forceps more enlarged at apex, more as in *caudata*. *Female.*—Genital segment relatively very large, almost as large as rest of abdomen and thorax combined, dorsal valve longer than ventral.

Described from numerous males and females from Claremont, California (Crawford), on *Artemisia californica*, April, 1912; Los Angeles, California (Koebele), on same host, April 23, 1886; Argus Mountains, California (Koebele), May, 1891; Ormsby County, Nevada (Baker); American Forks, Utah (Hubbard and Schwarz), June 22; Ogden, Utah (Koebele), on "sage," June 20, 1885; and on *Artemisia tridentata*, June 13, 1885; one female from Nebraska on *Artemisia tridentata.*

Manuscript name: *A. occidentalis* Riley.

Type in author's collection.

APHALARA (ANOMOCERA) ANOMALA, new species.

This species is somewhat similar in general proportions to *minutissima*, but a little larger and a little more robust. Antennæ short, a little longer and more slender than in *minutissima;* III relatively shorter; IX very short, indistinct, comprising only a short apical portion of VIII-IX. Forewings small, whitish, wrinkled, covered with numerous small round, brown spots, as in *artemisiæ.* In both forewings of all three specimens at hand (both sexes) there is a remarkable anomalous venational character; Cu^1 and M^3 unite and send a common vein to the margin, thus making a supernumerary cell. The uniformity of these veins in both forewings of several specimens is a remarkable anomaly. Additional material is necessary, however, to ascertain the general prevalence of this character.

Male genitalia somewhat similar in general type to those of *artemisiæ;* forceps with a small inner subapical tooth, not serrate on apical margin, as in *minutissima.* Female genitalia, as in *artemisiæ.*

Described from two females from Sacramento, California (Koebele), June 28, 1885, and one from Folsom, California (Koebele). No other specimens from either of these localities are available. These bear the manuscript name of *A. occidentalis anomala* Riley. *A. occidentalis* was a manuscript name for *minutissima.*

Type.—Cat. No. 18069, U. S. Nat. Mus.

APHALAROIDA, new genus.

Head resembling somewhat that of *Aphalara,* but shorter, slightly less flattened, somewhat rounded down in front, but much less so than in *Heteropsylla;* genæ somewhat swollen beneath, never conical, not covering frons; frons similar to *Aphalara,* but much shorter. Antennæ very short. Thorax only slightly arched; pronotum terminating laterad in a knob-like swelling, with the pleural suture extending to the midpoint of this as in *Aphalara.* Wings small, thickened, opaque, or semiopaque, often maculated, with a pterostigma. Anal valve of male simple, not as in *Aphalara.* Body surface often covered with glandular hairs.

Type of genus.—Aphalaroida pithecolobia, new species.

This is a very homogeneous and interesting little group of species, distributed over southwestern and southern United States. There is a remarkable similarity throughout the genus in structural characters, the species differing chiefly in size, amount of glandular pubescence and in markings of body and wings. There is some data to show that summer and winter forms of the same species differ in color and markings to some extent. The species are so similar that only a brief description of all but the type is given herewith.

SYNOPSIS OF SPECIES.

- a^1. Head, thorax, and sometimes wings covered more or less densely with white glandular hairs.
  - b^1. Forewings not maculated, almost or quite uniform in color; hairs not dense on body, often wanting on wings.....................*pithecolobia*, new species.
  - b^2. Forewings maculated, not uniform in color.
    - c^1. Body large, more than 2.5 mm to tip of folded wings; forewings brown and white; body and wings covered very densely with long white hairs (some times shorter and more sparse, or almost wanting in a few specimens); dorsum brown with orange stripes and bands.........*spinifera*, new species.
    - c^2. Body smaller, less than 2 mm to tip of wings; body and usually the wings covered more or less densely with short white hairs; color dark; wings white, with brown maculæ; dorsum uniform brown to black.*prosopis*, new species.
- a^2. Body and wings without glandular hairs, or if present, very short and inconspicuous; body medium to small.
  - b^1. Forewings brown, with numerous small white spots scattered over surface ....*inermis*, new species.
  - b^2. Forewings white, with a broad, crescentic, brown macula on apical and posterior margin, often extending into primary furcation of M+Cu. *Winter form:* Wings brown, with the same macula black..............*acaciæ*, new species.

APHALAROIDA PITHECOLOBIA, new species.

Figs. 59, 239, 284, 449.

Length of body 1.4 mm.; length of forewing 1.7; width of head 0.70. General color whitish to very light brown. Body small, finely pubescent. In all the specimens before me the hairs have collected particles of the fine waxy excrement.

Head not deflexed, not as broad as thorax, punctate; posterior margin arcuate; vertex discally rather plane, with a small foveal impression on each side of median line, scarcely elevated on postocellar regions, rounded downward in front, with anterior ocellus beneath. Antennal insertions large, lateral, in front of eyes; genæ and subantennal regions somewhat swollen. Eyes small. Antennæ not longer than width of head, slender.

Thorax broad, coarsely punctate. Pronotum flat, with lateral "knob" small; pleurites short; dorsum finely pubescent. Wings small, slightly rhomboidal, coriaceous, white to light brown, deeply wrinkled, granulate; about two and a fourth times as long as broad, somewhat rounded at apex; first marginal cell larger than second; pterostigma long and conspicuous; claval suture prominent; veins set biseriately with conspicuous setæ, similar in appearance to those on dorsum and vertex.

Genitalia.—*Male.*—Genitalia relatively not very small; forceps large, short, broad, subspatulate; anal valve very long and slender, simple, square at tip. *Female.*—Genital segment short, broad, acute at apex; valves of equal length; pubescence quite dense.

Described from 14 males and females collected by E. A. Schwarz at Devil's River, Texas, on *Pithecolobium.*

Type in author's collection.

APHALAROIDA SPINIFERA, new species.

Fig. 399.

Length of body 1.7 mm.; length of forewing 2. General color brown, with orange markings, sometimes more uniformly orange to yellowish (probably immature forms); vertex orange on lateral half of each lobe; pronotum and præscutum orange on posterior portion; scutum orange on median dorsal line and around wing bases, and a narrow arcuate line halfway between these; venter dark; forewings whitish, with irregular brown maculæ, usually as represented in figure, sometimes less maculated; some forms are lighter with only a few small scattered maculæ on the wings.

Head, thorax, wings, legs, and abdomen (to a less extent) densely, often very densely, covered with long white hairs which are usually clavate because of the excretions on them; sometimes the hairs are fewer or even almost wanting in rare instances. Head distinctly narrower than thorax, deflexed somewhat, similar in general to type species; antennæ one and a half times as long as width of head. Thorax long, rather broad. Wings over two and a half times as long as broad, coriaceous, maculated, rhomboidal, apex at termination of radial sector; first marginal cell larger than second.

Genitalia.—*Male.*—Resemble type species; forceps stout, about twice as long as broad, oval; anal valve nearly twice as long as forceps, converging a little toward apex. *Female.*—Genital segment stout, shorter than rest of abdomen, subacute at apex.

Described from 30 males and females from Tucson, Arizona (H. G. Hubbard), on *Prosopis juliflor,* in December and January; 7 from Palm Springs, California (Hubbard), on *Phoradendron,* growing on *Acacia gregii;* 16 from Argus and Panamint Mountains, California (Koebele), April. All in the collection of the United States National Museum. The Arizona specimens bear the label *Rhinocola spinifera,* a manuscript name; the California forms are labeled *Rhinocola rauca,* but are apparently the same species.

Type.—Cat. No. 18070, U. S. Nat. Mus.

APHALAROIDA PROSOPIS, new species.

Fig. 404.

Length of body 1.7 mm.; length of forewing 1.5. General color dark brown to black uniformly; forewings maculated with dark brown, as in figure. Body small. Glandular hairs dense, but short, on head, thorax, and wings and sometimes the legs.

Head narrower than thorax, deflexed; antennæ a little longer than width of head. Eyes small. Thorax arched somewhat; pronotum moderately long; meso-episternum prominently bulging between fore and middle coxæ. Forewings small, coriaceous, rhomboidal slightly, with apex between radial sector and medial branch, less than two and a half times as long as broad, very slightly transparent on white portions, granulate; marginal cells subequal; pterostigma long.

Genitalia.—Male.—Genitalia similar to type-species; relatively small; forceps narrower than in *spinifera;* anal valve not much longer than forceps. *Female.*—Genitalia similar to type species.

Described from 10 males and females collected at Tucson, Arizona, by H. G. Hubbard, in January, on *Prosopis juliflor,* and 15 on "Larrea," on December 13, 1896, at the same place. These specimens were labeled *Rhinocola prosopis* (manuscript).

Type.—Cat. No. 18071, U. S. Nat. Mus.

APHALAROIDA INERMIS, new species.

Fig. 398.

Length of body 1.7 mm.; length of forewing 1.8. General color light chocolate brown over most of body surface, including legs; vertex often lighter; thoracic markings as in *spinifera;* wings light brown, with small, irregular white spots, which are sometimes rather large. Body small to medium in size, without conspicuous glandular hairs except in front of vertex and in front of wing bases, very small.

Head almost as broad as thorax, relatively large; vertex rather long, more or less rectangular. Antennæ a little longer than width of head. Thorax as in related species. Forewings nearly two and a half times as long as broad, rather thick, coriaceous, somewhat rhomboidal; pterostigmal vein (R) incomplete; marginal cells subequal. Genitalia of both sexes similar to *prosopis.*

Described from many males and females from Tucson and Fort Yuma, Arizona (Hubbard), December and January, on *Prosopis juliflor;* Palm Springs, California (Hubbard), February; one female from San Antonio, Texas (E. A. Schwarz), on *Mimosa borealis,* in May.

Type.—Cat. No. 18072, U. S. Nat. Mus.

APHALAROIDA ACACIAE, new species.

Fig. 397.

Length of body 1.7 mm.; length of forewing 1.7. General color brown; vertex light brown; thoracic dorsum marked as in *spinifera* but much more indistinctly so; forewings (summer form) largely whitish with a brown to dark brown macula as in illustration; (winter form): Darker on body; wings darker, with macula black. Body and wings without glandular hairs, or with extremely short ones; usually almost glabrous. Body small to medium in size.

Head narrower than thorax; relatively smaller than in *inermis;* antennæ about as long as width of head, light colored. Thorax of typical form. Wings slightly rhomboidal, thickened, granulate, less than two and a half times as long as broad; pterostigma long; marginal cells subequal.

Genitalia.—Male and female genitalia similar to type-species.

Described from 17 males and females from San Diego, Texas (E. A. Schwarz), on *Acacia amentacea*, May, October, and December; 1 female from Palm Springs, California (Hubbard), on *Phorodendron* growing on *Acacia gregii*, February.

Type.—No. 18073, U. S. Nat. Mus.

Subfamily PAUROPSYLLINÆ.

The chief characteristics of this subfamily are the rounded head and the usually visible frons. Head short, uniformly rounded forward and down, with the frons usually not concealed by the genæ and the genæ variously swollen (conical in *Calophya*). Wings hyaline, ovate; pterostigma usually large and long; first marginal cell often enlarged, or long and narrow.

The typical genus, *Pauropsylla*, is not represented in the American fauna. For a description of this genus see Rübsaamen **'99**: 263; Kieffer **'05**: 167; or Crawford **'12c**: 429.

SYNOPSIS OF GENERA.

*a*¹. Genæ more or less swollen, but not produced into conical processes; frons always visible; first marginal cell not unusually large.
  *b*¹. Frons, genæ and vertex forming a relatively smooth surface, frons not as in following genus; head uniformly rounded forward and down; antennæ not very long.. *Paurocephala* Crawford
  *b*². Frons forming the bottom of a groove between genæ, with genæ protruding below frons; head less uniformly rounded down in front; antennæ very long and slender.. *Heteropsylla*, new genus
*a*². Genæ produced into two short or longer conical processes, with the frons sometimes covered; head rounded downward as in the first genus; first marginal cell very much larger than second; antennæ short .... *Calophya* Loew

Genus PAUROCEPHALA Crawford.[1]

Body robust, surface strigate; thorax strongly arched. Head strongly deflexed, rounded downward in front, presenting a roundly convex surface in dorsal view; frons not covered by genæ, visible as a small sclerite forming an uninterruptedly smooth surface with vertex and genæ; genæ not conical, though often swollen. Eyes large. Antennæ longer than width of head. Wings hyaline, more or less oval in shape, with a pterostigma.

Type of genus.—*P. psylloptera* Crawford (a Philippine species).

PAUROCEPHALA MAGNIFRONS, new species.

Figs. 16, 73, 296, 461.

Length of body, 2.6 mm.; length of forewing 3.5; width of head 1. General color greenish yellow throughout.

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[1] The first description of this genus is being published in the Philippine Journal of Science, Vol. 8, No. 4, sec. D, p. 293, Aug. 1913.

Head broad, but not as broad as thorax, very uniformly rounded downward in front; vertex rather large, converging toward front; frons unusually large, a heptagonal sclerite visible from in front, broadest at ocellus, continuing uniformly the surface of vertex and genæ; genæ large, swollen lobately on each side beneath antennal bases, with a long hair at lowermost point; clypeus rather large; (antennæ broken).

Thorax well arched, coarsely punctate or strigate; pronotum long. Hind tibiæ with a spur at base. Wings long, hyaline, transparent, about two and two-thirds times as long as broad, narrowed toward apex, rounded at tip; first marginal cell broader than in *ilicis;* pterostigma long, broad at base.

Genitalia.—Female—Genital segment about half as long as rest of abdomen, acute; dorsal valve a little longer than ventral, with a tuft of hairs dorsad.

Described from one female from Escuintla, Chiapas, Mexico (Crawford), July 25, 1910.

Type in author's collection.

PAUROCEPHALA ILICIS Ashmead.

Figs. 102, 103, 104, 105, 108, 410.

Psylla ilicis ASHMEAD '81: 225.
Aphalara ilicis RILEY '83: 69.
N. B.—*Psyllopa ilicis* CRAWFORD '11c: 632 is a different insect.

Length of body 2 mm.; length of forewing 2.6; width of head 0.93. General color flavous; antennæ brown.

Head uniformly rounded down and forward as in *magnifrons;* frons smaller, similar in position; genæ less swollen, making head appear more as a longitudinal portion of a cylinder. Antennæ about twice as long as width of head, not very slender. Clypeus large, conical, perpendicular. Thorax moderately broad. Propleurites rather large, with pleural suture oblique. Legs rather short; hind tibiæ without spur at base. Wings hyaline, elongate-ovate, venation typical of genus; first marginal cell elongate; pterostigma large.

Genitalia.—Male.—Genitalia as in *Aphalara;* anal valve with a similar long, caudal projection from the perpendicular axis; forceps slender, converging to an acute point, bowed. *Female.*—Genital segment about as long as rest of abdomen, very acutely pointed, dorsal valve a little longer than ventral, with long pubescence dorsad.

Described from eight males and females from Savannah, Georgia (Schwarz), April 15, 1884. These bear the label "*Aphalara ilicis* Ashmead." This is an entirely different insect from that described by myself recently from Florida (Crawford '11c: 629,632), and called *Psyllopa floridensis* first and then corrected to *Psyllopa ilicis.* Judging from Ashmead's description of the nymph, I am inclined to believe that the latter is correct, while the present species, of *Pauro-*

cephala, is a distinct and new species. However, since these have been determined as Ashmead's *ilicis* and the other is merely a surmise, *ilicis* should be placed in *Paurocephala* and the Florida species become *Psyllopa floridensis*. The latter species, it is shown later (p. 129), is identical with *Arytaina amorphæ* (Mally).

HETEROPSYLLA, new genus.

Body usually small. Head short, rather small, deflexed, rounded forward and down in front, but less evenly so than in preceding genus; genæ somewhat swollen beneath vertex, but not produced into conical processes; with the frons as a visible sclerite between the genæ and forming the bottom of a groove between them, somewhat resembling *Aphalaroida* in shape of frons; clypeus pyriform, not large. Eyes medium to small in size. Antennæ very long and very slender. Thorax not strongly arched; propleurites narrow, largely concealed by receding head. Wings broadly rounded at apex, hyaline, with a broad pterostigma.

Type of genus.—Heteropsylla texana, new species.

SYNOPSIS OF SPECIES.

a^1. Forewings maculated apically around marginal cells and on apex of radial sector; genæ conspicuously swollen ventrad; male forceps bidentate at apex. .... *texana*, new species.

a^2. Forewings not maculated; hyaline or indistinctly fumate, transparent; genæ not conspicuously swollen ventrad.

- b^1. Antennæ distinctly more than twice as long as width of head, usually at least two and a half times as long; frons partially or nearly entirely covered by genæ.
  - c^1. Forceps of male very long, arcuate caudad, divided from base into two parts; anterior part thin, sulcate, square at tip; posterior part spiniform, as long as other part, scarcely pubescent.......... *forcipata*, new species.
  - c^2. Forceps of male about half as long as in *forcipata*, divided from base, but posterior part very slender and inconspicuous; pubescence much denser .... *mexicana*, new species.
- b^2. Antennæ not over twice as long as width of head; frons entirely visible.
  - c^1. Female genital segment almost as long as rest of abdomen, dorsal valve distinctly longer than ventral.
    - d^1. Forceps of male as long as anal valve or longer; forewings clear; body very often light colored.
      - e^1. Forceps with a long posterior, spiniform process, extending from near base to near tip; dorsal valve of female genital segment less than twice as long as ventral.......... *cubana*, new species.
      - e^2. Forceps larger, with a short process arising from near middle and extending obliquely inward and upward; dorsal valve of female genital segment fully twice as long as ventral.......... *quassiæ*, new species.
    - d^2. Forceps of male about half as long as anal valve, very short; forewings slightly fumate; head and thorax usually dark colored. .*fusca*, new species.
  - c^2. Female genital segment exceedingly short; ventral valve much shorter than dorsal; male forceps somewhat similar to those of *cubana*. *mimosæ*, new species.

HETEROPSYLLA TEXANA, new species.

Figs. 70, 246, 295, 456.

Length of body 1.5 mm.; length of forewing 2.1; width of head 0.75. General color orange yellow to reddish brown; abdomen often lighter than thorax and head, sometimes darker; mesonotum often striped with brown.

Head about as broad as thorax, deflexed, rounded forward between antennæ, slightly strigate, arcuate on posterior margin; vertex with a slight foveal depression on each side of median line, elevated on postocellar regions, not emarginate in front at median line; genæ large and swollen, with a long seta at apex of swelling; frons not covered by genæ, visible as a small sclerite between the genæ but not forming a smooth surface with the latter, appearing somewhat as a short stalk of the front ocellus. Antennæ about twice as long as width of head or more, very slender.

Thorax arched, rather broad, coarsely punctate; pronotum short, attaining laterad about to upper margin of eyes; pleural suture long, oblique; pleurites narrow. Wings relatively large, hyaline, maculated on basal and apical margins, with a brown macula at tip of claval suture, a curved one around the forks of the cubitus, and another at tip of radial sector; about two and a fifth times as long as broad, broad and broadly rounded apically; first marginal cell larger than second; pterostigma yellowish, rather short.

Genitalia.—Male.—Forceps short, broad, rather deeply notched at tip, with posterior process longer than anterior, both acute; anal valve short, simple, slender, truncate at apex, pubescence sparse.—*Female.*—Genital segment moderately long, acute; dorsal valve distinctly longer than ventral, with a prominent convexity dorsad at base.

Described from many males and females in a collection sent to me by Mr. W. D. Hunter, and many in the United States National Museum collection. Type-locality: Devils River, Texas (E. A. Schwarz), on *Pithecolobium;* also, on *Sphaeralcea angustifolia* (F. C. Pratt), and on *Monarda citriodora,* in the same locality; other localities: Dallas, Texas (W. W. Yothers and C. R. Jones); Corpus Christi, Texas (R. A. Cushman), on *Chrysopsis sp.;* Galveston, Texas (W. D. Pierce), on *Tamarax gallica;* San Antonio, Texas (E. A. Schwarz, F. C. Pratt), on *Celtis pallida;* Kerrville, Texas (Pratt), at light; Cuero, Texas (Cushman); Victoria, Texas (J. D. Mitchell), on *Acacia;* Plano, Texas (Tucker). The dates of collection range from March to August. In the National Museum collection as follows: Wades, Texas (Hubbard and Schwarz), on *Prosopis juliflor,* May 22; Austin, Texas, on *Prosopis sp.,* August 7, 1894; Fort Yuma, Arizona (Hubbard), on *Prosopis juliflor,* January 21; Colorado (C. P. Gillette), no data; Wellington, Kansas (E. G. Kelly). Some of these specimens are labeled *Pseudaphalara prosopis* Schwarz (manuscript).

Type in author's collection.

One female of *A. schwarzii* (a paratype), from Popoff Island, Alaska (Harriman-Alaska Expedition) is colored very similarly to the darker forms of *alaskensis*. Ashmead's figure of the male genitalia of *schwarzii* is practically meaningless, and therefore I am unable to state with certainty whether or not these two species are identical. It seems probable, however, that they are at least closely related.

APHALARA NEBULOSA KINCAIDI Ashmead.

Figs. 167, 174, 175, 508.

Aphalara kincaidi Ashmead '10: 136.
A. nebulosa americana Crawford '11b: 503.—Patch '12b: 219.

Length of body (male) 1.8 mm; (female) 2.2; length of forewing 2.2 to 2.4; width of head 0.82. General color brown to blackish, with flavous markings on vertex and thoracic dorsum; wings transparent, maculated brown in apical half, as shown in figure; legs pale brown; antennæ flavous, black distally.

Head almost as broad as thorax, not deflexed; vertex large, almost flat, resembling *alaskensis*, but more emarginate in front; antennæ about one and a half times as long as width of head; clypeus smaller than in European *nebulosa* and more posterior. Thorax rather flat, not very broad, strigate. Wings about two and a half times as long as broad, rather transparent, maculated, venation as usual in genus.

Genitalia.—*Male.*—Posterior lobe of anal valve not as in other species of genus, but conspicuously lanceolate with a petiolate base, and a ridged "midrib" in basal portion; forceps moderately long, constricted subapically, and apex abruptly broadened out, T-shaped, with anterior part of apex longer than posterior. *Female.*—Genital segment rather long, but not as long as rest of abdomen; dorsal valve longer than ventral.

Described from one male (paratype of *A. kincaidi*), from Popoff Island, Alaska, July 9, 1899, collected by the Harriman-Alaska Expedition; many males and females from Easton, Washington (Koebele); Fieldbrook, California (H. S. Barber), May 19, 1903; Colorado (no data). Manuscript name: *Aphalara epilobii* Riley.

The American variety differs from the European form as follows: Clypeus smaller and situated farther back; male forceps larger, with apical transverse part almost as long as vertical portion, while in the other it is only a little over half as long; wing picture lighter in color.

ANOMOCERA, new subgenus.

Although a reduction in the number of antennal segments in Psyllidæ is apparently a striking character, judging from the small number of species which show this character, yet this alone may not warrant the erection of a new genus. Two species of *Aphalara* with the antennal segments distinctly reduced are so similar to other species of the genus in nearly every other respect that it seems advisable to regard them as forming a subgeneric group within the genus *Aphalara*. Because of this antennal reduction the name *Anomocera* is given to the subgenus.

The antennæ are short, but not unusually so. The reduction seems to have occurred in the apical segments. The two basal segments are normally enlarged; the third is longest and the succeeding segments subequal to each other. What appears to be the terminal, (eighth) segment is really composed of two short closely connate segments, thus making the antennæ nine-segmented, but apparently only eight-segmented. Other characters are more or less similar to the *holocerous* species.

Type of subgenus.—*Aphalara* (*Anomocera*) *minutissima* Crawford.

APHALARA (ANOMOCERA) MINUTISSIMA Crawford.

Figs. 169, 177, 381, 507.

Aphalara minutissima CRAWFORD '11b: 500.

Similar in size and general gross appearance to *artemisiæ*, differing as follows: Color a little more whitish; wings white, not spotted; antennæ of about the same relative length but only nine-segmented, with the terminal two segments so closely connate that they appear as one segment except by close examination. Thorax usually less arched, coarsely punctate. Wings more narrowed apically, thick, whitish, not spotted or maculated, venation as usual for genus; sometimes slightly brownish toward apex.

Genitalia.—*Male.*—Genitalia similar, but forceps more enlarged at apex, more as in *caudata*. *Female.*—Genital segment relatively very large, almost as large as rest of abdomen and thorax combined, dorsal valve longer than ventral.

Described from numerous males and females from Claremont, California (Crawford), on *Artemisia californica*, April, 1912; Los Angeles, California (Koebele), on same host, April 23, 1886; Argus Mountains, California (Koebele), May, 1891; Ormsby County, Nevada (Baker); American Forks, Utah (Hubbard and Schwarz), June 22; Ogden, Utah (Koebele), on "sage," June 20, 1885; and on *Artemisia tridentata*, June 13, 1885; one female from Nebraska on *Artemisia tridentata*.

Manuscript name: *A. occidentalis* Riley.

Type in author's collection.

APHALARA (ANOMOCERA) ANOMALA, new species.

This species is somewhat similar in general proportions to *minutissima*, but a little larger and a little more robust. Antennæ short, a little longer and more slender than in *minutissima;* III relatively shorter; IX very short, indistinct, comprising only a short apical portion of VIII-IX. Forewings small, whitish, wrinkled, covered with numerous small round, brown spots, as in *artemisiæ.* In both forewings of all three specimens at hand (both sexes) there is a remarkable anomalous venational character; Cu^1 and M^3 unite and send a common vein to the margin, thus making a supernumerary cell. The uniformity of these veins in both forewings of several specimens is a remarkable anomaly. Additional material is necessary, however, to ascertain the general prevalence of this character.

Male genitalia somewhat similar in general type to those of *artemisiæ;* forceps with a small inner subapical tooth, not serrate on apical margin, as in *minutissima.* Female genitalia, as in *artemisiæ.*

Described from two females from Sacramento, California (Koebele), June 28, 1885, and one from Folsom, California (Koebele). No other specimens from either of these localities are available. These bear the manuscript name of *A. occidentalis anomala* Riley. *A. occidentalis* was a manuscript name for *minutissima.*

Type.—Cat. No. 18069, U. S. Nat. Mus.

APHALAROIDA, new genus.

Head resembling somewhat that of *Aphalara,* but shorter, slightly less flattened, somewhat rounded down in front, but much less so than in *Heteropsylla;* genæ somewhat swollen beneath, never conical, not covering frons; frons similar to *Aphalara,* but much shorter. Antennæ very short. Thorax only slightly arched; pronotum terminating laterad in a knob-like swelling, with the pleural suture extending to the midpoint of this as in *Aphalara.* Wings small, thickened, opaque, or semiopaque, often maculated, with a pterostigma. Anal valve of male simple, not as in *Aphalara.* Body surface often covered with glandular hairs.

Type of genus.—Aphalaroida pithecolobia, new species.

This is a very homogeneous and interesting little group of species, distributed over southwestern and southern United States. There is a remarkable similarity throughout the genus in structural characters, the species differing chiefly in size, amount of glandular pubescence and in markings of body and wings. There is some data to show that summer and winter forms of the same species differ in color and markings to some extent. The species are so similar that only a brief description of all but the type is given herewith.

SYNOPSIS OF SPECIES.

a^1. Head, thorax, and sometimes wings covered more or less densely with white glandular hairs.
  b^1. Forewings not maculated, almost or quite uniform in color; hairs not dense on body, often wanting on wings.....................*pithecolobia*, new species.
  b^2. Forewings maculated, not uniform in color.
    c^1. Body large, more than 2.5 mm to tip of folded wings; forewings brown and white; body and wings covered very densely with long white hairs (some times shorter and more sparse, or almost wanting in a few specimens); dorsum brown with orange stripes and bands.........*spinifera*, new species.
    c^2. Body smaller, less than 2 mm to tip of wings; body and usually the wings covered more or less densely with short white hairs; color dark; wings white, with brown maculæ; dorsum uniform brown to black.*prosopis*, new species.
a^2. Body and wings without glandular hairs, or if present, very short and inconspicuous; body medium to small.
  b^1. Forewings brown, with numerous small white spots scattered over surface ....*inermis*, new species.
  b^2. Forewings white, with a broad, crescentic, brown macula on apical and posterior margin, often extending into primary furcation of M+Cu. *Winter form:* Wings brown, with the same macula black..............*acaciæ*, new species.

APHALAROIDA PITHECOLOBIA, new species.

Figs. 59, 239, 284, 449.

Length of body 1.4 mm.; length of forewing 1.7; width of head 0.70. General color whitish to very light brown. Body small, finely pubescent. In all the specimens before me the hairs have collected particles of the fine waxy excrement.

Head not deflexed, not as broad as thorax, punctate; posterior margin arcuate; vertex discally rather plane, with a small foveal impression on each side of median line, scarcely elevated on postocellar regions, rounded downward in front, with anterior ocellus beneath. Antennal insertions large, lateral, in front of eyes; genæ and subantennal regions somewhat swollen. Eyes small. Antennæ not longer than width of head, slender.

Thorax broad, coarsely punctate. Pronotum flat, with lateral "knob" small; pleurites short; dorsum finely pubescent. Wings small, slightly rhomboidal, coriaceous, white to light brown, deeply wrinkled, granulate; about two and a fourth times as long as broad, somewhat rounded at apex; first marginal cell larger than second; pterostigma long and conspicuous; claval suture prominent; veins set biseriately with conspicuous setæ, similar in appearance to those on dorsum and vertex.

Genitalia.—*Male.*—Genitalia relatively not very small; forceps large, short, broad, subspatulate; anal valve very long and slender, simple, square at tip. *Female.*—Genital segment short, broad, acute at apex; valves of equal length; pubescence quite dense.

Described from 14 males and females collected by E. A. Schwarz at Devil's River, Texas, on *Pithecolobium*.

Type in author's collection.

APHALAROIDA SPINIFERA, new species.

Fig. 399.

Length of body 1.7 mm.; length of forewing 2. General color brown, with orange markings, sometimes more uniformly orange to yellowish (probably immature forms); vertex orange on lateral half of each lobe; pronotum and præscutum orange on posterior portion; scutum orange on median dorsal line and around wing bases, and a narrow arcuate line halfway between these; venter dark; forewings whitish, with irregular brown maculæ, usually as represented in figure, sometimes less maculated; some forms are lighter with only a few small scattered maculæ on the wings.

Head, thorax, wings, legs, and abdomen (to a less extent) densely, often very densely, covered with long white hairs which are usually clavate because of the excretions on them; sometimes the hairs are fewer or even almost wanting in rare instances. Head distinctly narrower than thorax, deflexed somewhat, similar in general to type species; antennæ one and a half times as long as width of head. Thorax long, rather broad. Wings over two and a half times as long as broad, coriaceous, maculated, rhomboidal, apex at termination of radial sector; first marginal cell larger than second.

Genitalia.—Male.—Resemble type species; forceps stout, about twice as long as broad, oval; anal valve nearly twice as long as forceps, converging a little toward apex. *Female.*—Genital segment stout, shorter than rest of abdomen, subacute at apex.

Described from 30 males and females from Tucson, Arizona (H. G. Hubbard), on *Prosopis juliflor*, in December and January; 7 from Palm Springs, California (Hubbard), on *Phoradendron*, growing on *Acacia gregii;* 16 from Argus and Panamint Mountains, California (Koebele), April. All in the collection of the United States National Museum. The Arizona specimens bear the label *Rhinocola spinifera*, a manuscript name; the California forms are labeled *Rhinocola rauca*, but are apparently the same species.

Type.—Cat. No. 18070, U. S. Nat. Mus.

APHALAROIDA PROSOPIS, new species.

Fig. 404.

Length of body 1.7 mm.; length of forewing 1.5. General color dark brown to black uniformly; forewings maculated with dark brown, as in figure. Body small. Glandular hairs dense, but short, on head, thorax, and wings and sometimes the legs.

Head narrower than thorax, deflexed; antennæ a little longer than width of head. Eyes small. Thorax arched somewhat; pronotum moderately long; meso-episternum prominently bulging between fore and middle coxæ. Forewings small, coriaceous, rhomboidal slightly, with apex between radial sector and medial branch, less than two and a half times as long as broad, very slightly transparent on white portions, granulate; marginal cells subequal; pterostigma long.

Genitalia.—*Male.*—Genitalia similar to type-species; relatively small; forceps narrower than in *spinifera;* anal valve not much longer than forceps. *Female.*—Genitalia similar to type species.

Described from 10 males and females collected at Tucson, Arizona, by H. G. Hubbard, in January, on *Prosopis juliflor,* and 15 on "Larrea," on December 13, 1896, at the same place. These specimens were labeled *Rhinocola prosopis* (manuscript).

Type.—Cat. No. 18071, U. S. Nat. Mus.

APHALAROIDA INERMIS, new species.

Fig. 398.

Length of body 1.7 mm.; length of forewing 1.8. General color light chocolate brown over most of body surface, including legs; vertex often lighter; thoracic markings as in *spinifera;* wings light brown, with small, irregular white spots, which are sometimes rather large. Body small to medium in size, without conspicuous glandular hairs except in front of vertex and in front of wing bases, very small.

Head almost as broad as thorax, relatively large; vertex rather long, more or less rectangular. Antennæ a little longer than width of head. Thorax as in related species. Forewings nearly two and a half times as long as broad, rather thick, coriaceous, somewhat rhomboidal; pterostigmal vein (R) incomplete; marginal cells subequal. Genitalia of both sexes similar to *prosopis.*

Described from many males and females from Tucson and Fort Yuma, Arizona (Hubbard), December and January, on *Prosopis juliflor;* Palm Springs, California (Hubbard), February; one female from San Antonio, Texas (E. A. Schwarz), on *Mimosa borealis,* in May.

Type.—Cat. No. 18072, U. S. Nat. Mus.

APHALAROIDA ACACIAE, new species.

Fig. 397.

Length of body 1.7 mm.; length of forewing 1.7. General color brown; vertex light brown; thoracic dorsum marked as in *spinifera* but much more indistinctly so; forewings (summer form) largely whitish with a brown to dark brown macula as in illustration; (winter form): Darker on body; wings darker, with macula black. Body and wings without glandular hairs, or with extremely short ones; usually almost glabrous. Body small to medium in size.

Head narrower than thorax; relatively smaller than in *inermis;* antennæ about as long as width of head, light colored. Thorax of typical form. Wings slightly rhomboidal, thickened, granulate, less than two and a half times as long as broad; pterostigma long; marginal cells subequal.

Genitalia.—Male and female genitalia similar to type-species.

Described from 17 males and females from San Diego, Texas (E. A. Schwarz), on *Acacia amentacea,* May, October, and December; 1 female from Palm Springs, California (Hubbard), on *Phorodendron* growing on *Acacia gregii,* February.

Type.—No. 18073, U. S. Nat. Mus.

Subfamily PAUROPSYLLINÆ.

The chief characteristics of this subfamily are the rounded head and the usually visible frons. Head short, uniformly rounded forward and down, with the frons usually not concealed by the genæ and the genæ variously swollen (conical in *Calophya*). Wings hyaline, ovate; pterostigma usually large and long; first marginal cell often enlarged, or long and narrow.

The typical genus, *Pauropsylla,* is not represented in the American fauna. For a description of this genus see Rübsaamen **'99**: 263; Kieffer **'05**: 167; or Crawford **'12c**: 429.

SYNOPSIS OF GENERA.

*a*¹. Genæ more or less swollen, but not produced into conical processes; frons always visible; first marginal cell not unusually large.
  *b*¹. Frons, genæ and vertex forming a relatively smooth surface, frons not as in following genus; head uniformly rounded forward and down; antennæ not very long.. *Paurocephala* Crawford
  *b*². Frons forming the bottom of a groove between genæ, with genæ protruding below frons; head less uniformly rounded down in front; antennæ very long and slender.. *Heteropsylla*, new genus
*a*². Genæ produced into two short or longer conical processes, with the frons sometimes covered; head rounded downward as in the first genus; first marginal cell very much larger than second; antennæ short .... *Calophya* Loew

Genus PAUROCEPHALA Crawford.[1]

Body robust, surface strigate; thorax strongly arched. Head strongly deflexed, rounded downward in front, presenting a roundly convex surface in dorsal view; frons not covered by genæ, visible as a small sclerite forming an uninterruptedly smooth surface with vertex and genæ; genæ not conical, though often swollen. Eyes large. Antennæ longer than width of head. Wings hyaline, more or less oval in shape, with a pterostigma.

Type of genus.—*P. psylloptera* Crawford (a Philippine species).

PAUROCEPHALA MAGNIFRONS, new species.

Figs. 16, 73, 296, 461.

Length of body, 2.6 mm.; length of forewing 3.5; width of head 1. General color greenish yellow throughout.

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[1] The first description of this genus is being published in the Philippine Journal of Science, Vol. 8, No. 4, sec. D, p. 293, Aug. 1813.

Head broad, but not as broad as thorax, very uniformly rounded downward in front; vertex rather large, converging toward front; frons unusually large, a heptagonal sclerite visible from in front, broadest at ocellus, continuing uniformly the surface of vertex and genæ; genæ large, swollen lobately on each side beneath antennal bases, with a long hair at lowermost point; clypeus rather large; (antennæ broken).

Thorax well arched, coarsely punctate or strigate; pronotum long. Hind tibiæ with a spur at base. Wings long, hyaline, transparent, about two and two-thirds times as long as broad, narrowed toward apex, rounded at tip; first marginal cell broader than in *ilicis;* pterostigma long, broad at base.

Genitalia.—Female—Genital segment about half as long as rest of abdomen, acute; dorsal valve a little longer than ventral, with a tuft of hairs dorsad.

Described from one female from Escuintla, Chiapas, Mexico (Crawford), July 25, 1910.

Type in author's collection.

PAUROCEPHALA ILICIS Ashmead.

Figs. 102, 103, 104, 105, 108, 410.

Psylla ilicis ASHMEAD '81: 225.
Aphalara ilicis RILEY '83: 69.
N. B.—*Psyllopa ilicis* CRAWFORD '11c: 632 is a different insect.

Length of body 2 mm.; length of forewing 2.6; width of head 0.93. General color flavous; antennæ brown.

Head uniformly rounded down and forward as in *magnifrons;* frons smaller, similar in position; genæ less swollen, making head appear more as a longitudinal portion of a cylinder. Antennæ about twice as long as width of head, not very slender. Clypeus large, conical, perpendicular. Thorax moderately broad. Propleurites rather large, with pleural suture oblique. Legs rather short; hind tibiæ without spur at base. Wings hyaline, elongate-ovate, venation typical of genus; first marginal cell elongate; pterostigma large.

Genitalia.—Male.—Genitalia as in *Aphalara;* anal valve with a similar long, caudal projection from the perpendicular axis; forceps slender, converging to an acute point, bowed. *Female.*—Genital segment about as long as rest of abdomen, very acutely pointed, dorsal valve a little longer than ventral, with long pubescence dorsad.

Described from eight males and females from Savannah, Georgia (Schwarz), April 15, 1884. These bear the label "*Aphalara ilicis* Ashmead." This is an entirely different insect from that described by myself recently from Florida (Crawford '11c: 629,632), and called *Psyllopa floridensis* first and then corrected to *Psyllopa ilicis*. Judging from Ashmead's description of the nymph, I am inclined to believe that the latter is correct, while the present species, of *Pauro-*

cephala, is a distinct and new species. However, since these have been determined as Ashmead's *ilicis* and the other is merely a surmise, *ilicis* should be placed in *Paurocephala* and the Florida species become *Psyllopa floridensis*. The latter species, it is shown later (p. 129), is identical with *Arytaina amorphæ* (Mally).

HETEROPSYLLA, new genus.

Body usually small. Head short, rather small, deflexed, rounded forward and down in front, but less evenly so than in preceding genus; genæ somewhat swollen beneath vertex, but not produced into conical processes; with the frons as a visible sclerite between the genæ and forming the bottom of a groove between them, somewhat resembling *Aphalaroida* in shape of frons; clypeus pyriform, not large. Eyes medium to small in size. Antennæ very long and very slender. Thorax not strongly arched; propleurites narrow, largely concealed by receding head. Wings broadly rounded at apex, hyaline, with a broad pterostigma.

Type of genus.—*Heteropsylla texana*, new species.

SYNOPSIS OF SPECIES.

a^1. Forewings maculated apically around marginal cells and on apex of radial sector; genæ conspicuously swollen ventrad; male forceps bidentate at apex. .... *texana*, new species.

a^2. Forewings not maculated; hyaline or indistinctly fumate, transparent; genæ not conspicuously swollen ventrad.

  b^1. Antennæ distinctly more than twice as long as width of head, usually at least two and a half times as long; frons partially or nearly entirely covered by genæ.

    c^1. Forceps of male very long, arcuate caudad, divided from base into two parts; anterior part thin, sulcate, square at tip; posterior part spiniform, as long as other part, scarcely pubescent.................... *forcipata*, new species.

    c^2. Forceps of male about half as long as in *forcipata*, divided from base, but posterior part very slender and inconspicuous; pubescence much denser .... *mexicana*, new species.

  b^2. Antennæ not over twice as long as width of head; frons entirely visible.

    c^1. Female genital segment almost as long as rest of abdomen, dorsal valve distinctly longer than ventral.

      d^1. Forceps of male as long as anal valve or longer; forewings clear; body very often light colored.

        e^1. Forceps with a long posterior, spiniform process, extending from near base to near tip; dorsal valve of female genital segment less than twice as long as ventral................................ *cubana*, new species.

        e^2. Forceps larger, with a short process arising from near middle and extending obliquely inward and upward; dorsal valve of female genital segment fully twice as long as ventral.................... *quassiæ*, new species.

      d^2. Forceps of male about half as long as anal valve, very short; forewings slightly fumate; head and thorax usually dark colored. .*fusca*, new species.

    c^2. Female genital segment exceedingly short; ventral valve much shorter than dorsal; male forceps somewhat similar to those of *cubana*. *mimosæ*, new species.

HETEROPSYLLA TEXANA, new species.

Figs. 70, 246, 295, 456.

Length of body 1.5 mm.; length of forewing 2.1; width of head 0.75. General color orange yellow to reddish brown; abdomen often lighter than thorax and head, sometimes darker; mesonotum often striped with brown.

Head about as broad as thorax, deflexed, rounded forward between antennæ, slightly strigate, arcuate on posterior margin; vertex with a slight foveal depression on each side of median line, elevated on postocellar regions, not emarginate in front at median line; genæ large and swollen, with a long seta at apex of swelling; frons not covered by genæ, visible as a small sclerite between the genæ but not forming a smooth surface with the latter, appearing somewhat as a short stalk of the front ocellus. Antennæ about twice as long as width of head or more, very slender.

Thorax arched, rather broad, coarsely punctate; pronotum short, attaining laterad about to upper margin of eyes; pleural suture long, oblique; pleurites narrow. Wings relatively large, hyaline, maculated on basal and apical margins, with a brown macula at tip of claval suture, a curved one around the forks of the cubitus, and another at tip of radial sector; about two and a fifth times as long as broad, broad and broadly rounded apically; first marginal cell larger than second; pterostigma yellowish, rather short.

Genitalia.—Male.—Forceps short, broad, rather deeply notched at tip, with posterior process longer than anterior, both acute; anal valve short, simple, slender, truncate at apex, pubescence sparse.—*Female.*—Genital segment moderately long, acute; dorsal valve distinctly longer than ventral, with a prominent convexity dorsad at base.

Described from many males and females in a collection sent to me by Mr. W. D. Hunter, and many in the United States National Museum collection. Type-locality: Devils River, Texas (E. A. Schwarz), on *Pithecolobium;* also, on *Sphaeralcea angustifolia* (F. C. Pratt), and on *Monarda citriodora,* in the same locality; other localities: Dallas, Texas (W. W. Yothers and C. R. Jones); Corpus Christi, Texas (R. A. Cushman), on *Chrysopsis sp.;* Galveston, Texas (W. D. Pierce), on *Tamarax gallica;* San Antonio, Texas (E. A. Schwarz, F. C. Pratt), on *Celtis pallida;* Kerrville, Texas (Pratt), at light; Cuero, Texas (Cushman); Victoria, Texas (J. D. Mitchell), on *Acacia;* Plano, Texas (Tucker). The dates of collection range from March to August. In the National Museum collection as follows: Wades, Texas (Hubbard and Schwarz), on *Prosopis juliflor,* May 22; Austin, Texas, on *Prosopis sp.,* August 7, 1894; Fort Yuma, Arizona (Hubbard), on *Prosopis juliflor,* January 21; Colorado (C. P. Gillette), no data; Wellington, Kansas (E. G. Kelly). Some of these specimens are labeled *Pseudaphalara prosopis* Schwarz (manuscript).

Type in author's collection.

HETEROPSYLLA MEXICANA, new species.

Figs. 68, 244, 293, 455.

Length of body, 2 mm; length of forewing, 2.2; width of head, 0.76. General color, light brown to black.

Head almost as broad as thorax, scarcely deflexed, punctate; vertex similar to preceding species, not elevated on posterior margin, and less elevated on postocellar regions; genæ less swollen than in preceding species, but somewhat bulging roundly on each side of frons; frons small, often scarcely visible, being mostly covered by genæ. Antennæ about two and one-half times as long as width of head.

Thorax not strongly arched, coarsely punctate. Pronotum rather long, flat, reaching laterad to a little below upper margin of eyes; præscutum shorter than in preceding species. Wings hyaline, without maculæ, about two and a fourth times as long as broad, broadly rounded at apex; first marginal cell slightly smaller than second and different in shape; pterostigma brownish, almost as long as radial sector.

Genitalia.—*Male.*—Genitalia rather small; forceps short, about as long as anal valve, deeply divided from near base into an anterior, thin, slightly sulcate process, and a posterior, slender, spiniform process; anal valve simple, curved, slender; pubescence prominent.—*Female.*—Genital segment moderately long, acute at apex; dorsal valve much longer than ventral, with one long seta on dorsal surface.

Described from two males and five females collected at Jalapa, Mexico (Crawford), August 28, 1910.

Type in author's collection.

HETEROPSYLLA FORCIPATA, new species.

Figs. 116, 118.

This species is very closely related to *mexicana*, differing chiefly and widely in male genital characters. The forceps are nearly twice as long as the anal valve and arcuately curved forward; deeply divided as in *mexicana*, but the anterior portion more deeply sulcate and forming a groove in which lies the long posterior spiniform process, very acute at apex and as long as anterior part; pubescence very slight.

Described from one male from Oaxaca, Mexico (A. Koebele).

Type.—Cat. No. 18074, U. S. Nat. Mus.

HETEROPSYLLA CUBANA, new species.

Figs. 69, 245, 294, 458.

Length of body, 1.5 mm; length of forewing, 1.6; width of head, 0.71. General color, greenish yellow to yellowish brown throughout.

Head about as broad as thorax, rounded in front, punctate; vertex arcuate on posterior margin but not elevated there, with a prominent and deep fovea on each side of median line in rear center, elevated slightly on postocellar regions; genæ large, rather prominent; frons usually mostly covered by genæ but not entirely, visible as a small sclerite. Antennæ about twice as long as width of head.

Thorax arched, coarsely punctate, slightly pubescent. Pronotum rather long, flat; propleurites long and narrow; præscutum short. Wings small, hyaline, about two and one-third times as long as broad, broadly rounded at apex or somewhat squarish; first marginal cell larger than second; pterostigma rather long, and broad at base, yellowish.

Genitalia.—*Male.*—Genital segment small, rounded; forceps longer than anal valve, elliptical in profile, with a short narrow pedicel, rather flattened, with a long spiniform process arising from inner surface near base and extending backward and upward along posterior margin of forceps to near apex. Anal valve short, rather cylindrical, truncate at apex, sometimes nearly as long as forceps.—*Female.*—Genital segment almost as long as rest of abdomen, acute at apex, dorsal valve longer than ventral.

Described from numerous males and females collected at Havana, Cuba, by C. F. Baker, occurring in great numbers on *Leucaena glauca;* several specimens in the U. S. National Museum collection from Santiago de las Vegas, Cuba (P. Cardin), on *Poinciana regia*, December 29, 1910. Both plants belong to the Leguminosæ, the former being closely related to *Mimosa,* which is the food plant of another species of this same genus, in Texas.

Type in author's collection.

HETEROPSYLLA QUASSIÆ, new species.

Figs. 113, 117.

Length of body 1.5 mm; length of forewing 1.7; width of head 0.72. General color light yellowish orange to orange, vertex and dorsum of thorax sometimes brown, always more or less distinctly strigate.

Head and thorax similar in most respects to the following species (*fusca*). Forewings seldom fumate, sometimes very slightly so, usually clear. Male genital segment not as small as in *fusca;* forceps as long as anal valve, strap-shaped, curved inward at apex, tip rounded, black, sides parallel; with a short process on posterior side near middle, extending upward and inward for a short distance. Anal valve moderately long, of usual cylindrical shape. Female genital segment as in *fusca.*

Described from two males and seven females from the Bahama Islands, some of them from Nassau Island (Schwarz), March 27, 1879; and the rest from Long Island, April 3, 1879, on *Quassia* sp.

Type.—Cat. No. 18075, U. S. Nat. Mus.

HETEROPSYLLA FUSCA, new species.

Figs. 119, 125.

Length of body 1.5 mm; length of forewing 1.9; width of head 0.73. General color brown to dark brown on head and thoracic dorsum, yellow on venter and abdomen; apical half of antennæ, and sometimes femora, brown.

Head relatively rather large, as broad as thorax, surface distinctly strigate; vertex moderately long, not as long as broad, with the usual two foveal impressions, rounded in front; genæ less swollen than in most other species of the genus; frons largely visible, only slightly covered by genæ. Eyes large. Antennæ about twice as long as width of head.

Thorax arched, moderately broad, distinctly strigate on dorsum. Forewings slightly fumate over most of surface, similar in shape and venation to cogenors.

Genitalia.—Male.—Genital segment small; forceps small, very short, not much longer than broad, oval in profile, with a posterior spiniform process almost as long as main portion and lying closely appressed to it. Anal valve nearly twice as long as forceps, cylindrical, distal third narrowed, truncate at apex, pubescent. *Female.*—Genital segment as long as rest of abdomen; dorsal valve nearly twice as long as ventral, both acute.

Described from two males and four females from Santo Domingo, West Indies (Aug. Busck), August 6 and 7, 1905.

Type.—Cat. No. 18076, U. S. Nat. Mus.

HETEROPSYLLA MIMOSÆ, new species.

This species resembles more or less closely *mexicana* and *cubana* in some respects but is smaller than either. General color light orange to reddish brown.

Head as broad as thorax; vertex only very slightly impressed discally; frons largely visible between genæ; antennæ about twice as long as width of head. Forewings clear, venation similar.

Genitalia.—Male.—Genital segment small; forceps similar in outline to those of *fusca*, with a large, prominent spiniform process behind and between. Anal valve very short and thick. *Female.*—Genital segment exceedingly short, ventral valve sometimes scarcely visible, much shorter than dorsal.

Described from 18 males and females from Columbus, Texas (Schwarz), on *Mimosa sp.*, August 16; Brownsville, Texas (Hubbard and Schwarz), June; Victoria, Texas, July 29, 1903.

Type.—Cat. No. 18077, U. S. Nat. Mus.

Genus CALOPHYA Loew.

Body usually small to medium in size, robust. Head very short, seldom as broad as thorax; vertex smooth or impressed discally with foveæ, more or less roundly convex in front, sometimes very uniformly so, as in *Paurocephala;* genæ swollen, and usually produced into conical processes which may be very short and inconspicuous or quite long and acutely pointed; frons usually mostly covered by genæ, but often partially visible. Antennæ short and rather thick, seldom longer than width of head; terminal setæ rather long; segment III often nearly as long as IV–X combined. Thorax strongly arched, broad; propleurites largely covered by eyes. Forewings ovate, or more or less pointed at apex, hyaline to opaque, with a pterostigma; first marginal cell usually much larger than second.

Type of genus.—*Calophya rhois* Loew (not Glover).

The members of this genus, so far as is known, are confined, in this country, to species of *Rhus* (Sumach) and have been called the Sumach Psyllids. One species, *C. rhois* Loew, has been described from Europe and four from Japan by Kuwayama (*C. nigra, nigridorsalis, viridis,* and *viridiscutellata*). Five forms are known in this country. There is more or less close resemblance between this genus and *Pauropsylla* of which there are no American representatives.

SYNOPSIS OF SPECIES.

a^1. Genal cones distinctly longer than the width at base, coniform; wings rounded at apex.
  b^1. Cones very long, slender, white; wings hyaline, shining, slightly fumate along forks of media and cubitus; vertex and thorax black or brown. *californica* Schwarz.
  b^2. Cones not very long, only a little longer than basal width, acute.
    c^1. Cones thick at base, contiguous basally, divergent; wings yellowish, transparent; body in both sexes uniformly honey yellow........ *flavida* Schwarz.
    c^2. Cones slender, distinctly separated at base and extending outward; wings clear; head and thorax of male black, abdomen yellow; female yellow. *dubia*, new species.
a^2. Genal cones not longer than broad, usually very much reduced and not markedly coniform; wings more or less angulate at apex.
  b^1. Wings black or brown, not transparent, only semiangulate at apex; pterostigma very long; vertex black, depressed; posterior ocelli not visible from side; thorax orange yellow; praescutum not long; genal cones subacute at apex, directed forward; female genital segment short............. *nigripennis* Riley.
  b^2. Wings hyaline, transparent, shining, rather acute at apex; pterostigma very short and small; praescutum long; genal cones very short, subacute at apex, directed inward.
    c^1. Vertex and thorax black or brown; wing with a large brown macula at base of anterior basal cell .... *triozomima* Schwarz.
    c^2. Vertex and thorax honey yellow; wing clear, without macula in basal cell. *triozomima claripennis*, new variety.

CALOPHYA CALIFORNICA Schwarz.

Figs. 75, 248, 298, 463

Calophya californica Schwarz '04:242.

Length of body 1.6 mm.; length of forewing 1.8; width of head 0.69. General color black to brown; vertex and thorax shining black to light brown above, flavous ventrad; abdomen dark, except base and genital segment flavous; genal cones white; antennæ pale yellow except at tip; legs pale yellow, femora partially brown; wings clear.

Vertex very broadly impressed discally on each side of median line and somewhat bulging forward in front on each side of median line, very slightly pubescent; genal cones about half as long as vertex, more or less divergent, subhorizontal, scarcely visible from directly above, acute at tip, slightly pubescent. Antennæ about as long as width of head, rather thick, black at tip.

Thorax strongly arched, strigate dorsad; pronotum rather long. Forewings oval, about two and one-third times as long as broad, rounded at apex but not broadly so, clear, with a tinge of milky white sometimes apparent; pterostigma long and rather narrow; first marginal cell about twice as large as second.

Genitalia.—Male.—Genital segment usually pale straw-yellow; anal valve very large, broad, larger than ventral plate of segment; forceps moderately long, flattened, tip curved inward and forward, acute. *Female.*—Genital segment as long as three preceding ventral sclerites, very acute at apex, dorsal valve a little longer than ventral.

Described from many males and females from Claremont, California (Crawford), on *Rhus integrifolia*, April, 1910; several from Los Angeles, California (Koebele), on the same host plant, in March. The latter are paratypes.

Type.—Cat. No. 8147, U. S. Nat. Mus.

CALOPHYA FLAVIDA Schwarz.

Fig. 419.

Calophya flavida Schwarz '04:243.

Length of body 1.5 mm.; length of forewing 1.9; width of head 0.70. General color uniformly honey yellow; legs and antennæ paler, thorax sometimes with ill-defined markings of a pale brown color.

Head and thorax smooth, shining; vertex convexly rounded forward and down with a slight foveal impression on each side of median line (sometimes larger and very prominent); genæ distinctly coniform, stout, a little longer than basal width, scarcely one-third as long as vertex, contiguous at base, divergent, acute at apex, scarcely pubescent. Antennæ shorter than width of head, thick, slightly darker at tip.

Thorax broad, strongly arched, smooth. Forewings about two and one-third times as long as broad, rounded broadly at apex, pale yellow and scarcely shining, moderately transparent; pterostigma long, rather large; first marginal cell about twice as large as second.

Genitalia.—*Male.*—Anal valve relatively narrower than in *californica*, oblong-oval in profile; forceps similar in shape to *californica*. *Female.*—Genital segment a little longer than preceding ventral sclerite, very acute; dorsal valve scarcely longer than ventral.

Described from one male and five females from Washington, District of Columbia (Schwarz), on *Rhus glabra*, in May. These are apparently paratypes. Recorded also from Massachusetts and St. Louis, Missouri, by Mr. Schwarz.

Type.—Cat. No. 8148, U. S. Nat. Mus.

CALOPHYA DUBIA, new species.

Fig. 420.

Length of body 1.5 mm.; length of forewing 1.8; width of head 0.68. General color (male) head and thorax black dorsad, venter and abdomen yellow; legs, genal cones, antennæ (except tips) yellow. Female (see note below) honey yellow, as in *flavida*. Body rather small.

Vertex a little more flattened than in *flavida*, more deeply impressed discally, rounded down in front, smooth; genal cones well separated at base, a little longer than basal width, curved outward and subhorizontal, acute at tip, not pubescent. Antennæ nearly as long as width of head, rather thick.

Thorax arched, strigate dorsad. Forewings clear, or very slightly yellowish, transparent, rounded at apex rather narrowly; pterostigma short and broad; first marginal cell fully twice as large as second, or larger.

Genitalia.—*Male.*—Genitalia similar in general to first species; anal valve longer than broad, posterior margin arcuately rounded; forceps as in *californica*. *Female.*—Genital segment very short, about as long as preceding ventral sclerite; dorsal valve a little longer than ventral.

Described from one pair from Colorado, with no data accompanying them.

Type.—Cat. No. 18078, U. S. Nat. Mus. Female in author's collection.

This species seems to be distinct from all others, but it is with hesitation that it is described as new because of the absence of data. There can be no certainty that the female belongs to the same species as the male described above, but in spite of the color differences, the structure seems to indicate that they are the same species.

CALOPHYA TRIOZOMIMA Schwarz.

Figs. 74, 297, 462.

Calophya triozomima SCHWARZ '04: 241.

Length of body 1.7 mm; length of forewing 2.1; width of head 0.72. Vertex and thorax reddish brown to black; abdomen and legs yellowish; genal cones light orange; antennæ yellow, darker at tip. Body stout; surface smooth or slightly alutaceous.

Vertex moderately large, strongly rounded down in front; discal impressions variable, often large and extensive; genal cones very small, scarcely coniform, rather transverse, not visible from above, not acutely pointed. Antennæ not as long as width of head, thick.

Thorax stout, broad, strongly arched; dorsal surface punctate and strigate, more or less shining. Forewings about two and a third times as long as broad, hyaline, often with a yellowish tinge, transparent, distinctly angulate at apex; with a large black macula in anterior basal cell; veins prominent; pterostigma very small; first marginal cell about three times as large as second.

Genitalia.—*Male.*—Anal valve much longer than broad, both front and hind margins arcuate, narrow at apex; forceps similar in shape to *californica,* rather long, acute at tip. *Female.*—Genital segment almost as long as rest of abdomen; dorsal valve very acuminate, and acute at apex, longer than ventral.

Described from many males and females from Oracle and Santa Rita Mountains, Arizona (Hubbard and Schwarz), on *Rhus trilobata,* June and July (these are paratypes); several from Los Angeles County, California (Coquillett); Claremont, California (Baker); Boulder, Colorado (E. Bethel), on *Rhus trilobata;* Fort Collins, Colorado.

Type.—Cat. No. 8149, U. S. Nat. Mus.

CALOPHYA TRIOZOMIMA CLARIPENNIS, new variety.

This varietal form is very similar structurally to the species, but differs in the following respects. The vertex is more flattened and the front ocellus more nearly visible from above. The color differences are marked. The body is uniformly honey-yellow throughout; the forewing lacks the dark macula in the basal cell present in the species. The genital characters are quite similar.

Described from one male and three females from Galiuro Mountains, Arizona (H. G. Hubbard), on *Rhus* sp., May 25; and two females from Pagosa Springs, Colorado (Baker).

Type.—Cat. No. 18079, U. S. Nat. Mus.

CALOPHYA NIGRIPENNIS Riley.

Figs. 76, 250, 299, 464.

Psylla rhois GLOVER (not Loew) '77: 33.
Calophya rhois RILEY '83: 69.
Calophya nigripennis RILEY '83: 69.—SCHWARZ '04: 244.

Length of body 1.7 mm; length of forewing 2.1; width of head 0.72. Color of vertex, wings, and anterior and middle femora black to brown, wings sometimes light brown; abdomen light brown to almost black; genal cones and thorax bright orange or sulfur-yellow; antennæ, except at tip, posterior femora and all tibiæ pale yellow.

Vertex smooth, seldom alutaceous, shining, very convexly rounded downward in front, more so than in the other species of the genus. Genal cones small, not as long as basal width, often distinctly shorter, acute at apex, divergent, subhorizontal, not pubescent, contiguous at base. Antennæ shorter than width of head, thick, always black at tip.

Thorax smooth, less strongly arched than in preceding species, sometimes faintly alutaceous, sometimes striped on dorsum. Forewings thick, not transparent, somewhat punctulate, narrowly rounded at apex, about two and a half times as long as broad; pterostigma long and large; first marginal cell about twice as large as second. Hind wings somewhat fumate.

Genitalia.—*Male.*—Genitalia similar to *flavida;* anal valve broad, about two-thirds as broad as long, convex on both hind and front margins; forceps as in *flavida.* *Female.*—Genital segment scarcely as long as two preceding ventral sclerites, stout, not acuminate.

Described from six males and females from Washington, D. C. (Schwarz), on *Rhus copallina,* in May; several from Raleigh, North Carolina (E. P. Van Duzee), April; Falls Church, Virginia, June; Alabama; Pennsylvania (no data on the latter specimens). Mr. Schwarz gives, also, "various parts of Georgia."

Schwarz states that immature specimens resemble *flavida* but may be distinguished by the shorter vertex, shorter genal cones, differences in the genitalia, and slight differences in wing venation.

Subfamily CARSIDARINÆ.

Head deeply cleft in front, giving a bi-rostrate appearance, which is increased by the large basal antennal segments. Genæ variable in form, sometimes swollen into small or larger conical processes beneath antennal bases, sometimes not at all swollen; frons usually covered by genæ, somewhat as in Psyllinæ, or sometimes not covered and easily visible between genæ, as in Pauropsyllinæ. Antennæ usually long and slender, sometimes much thickened. Thorax not strongly arched. Hind tibiæ often with a spur at base. Wings hyaline, variously shaped, branching of veins usually not so typically dichotomous as in Psyllinæ (see illustrations of wings of *Carsidara*, especially the medial vein).

The members of this subfamily seem to be mostly tropical in their distribution. Four, out of a dozen or more genera, are represented in the American tropics and subtropics. The most characteristic feature of the group is the deeply cleft head and the peculiar type of wing venation, which is rather difficult to define. In this, as in the preceding subfamily, one genus distinctly *triozine* in many respects has been included. The relationships of this triozine genus, *Rhinopsylla*, to Carsidarinæ seem to be closer than to Triozinæ.

SYNOPSIS OF GENERA.

a^1. Frons not covered by genæ; antennæ greatly thickened in basal half.
  b^1. Antennæ much longer than body; genæ produced into two small, inferior cones; frons rather large; clypeus large; hind tibiæ without basal spur. *Freysuila* Aleman.
  b^2. Antennæ much shorter than body; genæ not produced as above; frons very narrow; clypeus small; hind tibiæ with a spur at base.... *Epicarsa* Crawford.
a^2. Frons covered by genæ, but sometimes not entirely so; antennæ not thickened in basal half.
  b^1. Cubital petiole (M+Cu) present; head very deeply cleft in front; anterior ocellus above; pterostigma present in forewing............ *Carsidara* Walker.
  b^2. Cubital petiole and pterostigma wanting (as in *Trioza*); head less deeply cleft; anterior ocellus in front.............................. *Rhinopsylla* Riley.

Genus FREYSUILA Aleman.

Frey-suila ALEMAN, '87: 21-26.
Freysuila SCHWARZ, '97:196.

Head very deeply cleft in front and deeply concave between posterior ocelli, strongly birostrate, with the thick antennæ attached to truncate apex of rostrate lobes and increasing the rostrate appearance; frons not covered by genæ, visible as an oblong sclerite between genæ; genæ swollen beneath antennæ, with a small inferior epiphysis; clypeus large. Antennæ very long; third joint unusually long and thick. Thorax large, broad, coarsely punctate. Hind tibiæ without spur at base. Wings large, hyaline, rounded at apex; pterostigma present.

Type of genus.—Freysuila dugesii Aleman.

SYNOPSIS OF SPECIES.

a^1. Third antennal joint not over twice as long as fourth, usually flavous; color of body uniformly flavous.
  b^1. Third antennal joint about twice as long as fourth; genal epiphyses acutely pointed; M+Cu shorter than R; veins yellow................ *dugesii* Aleman.
  b^2. Third antennal joint only a little longer than fourth; genal epiphyses smaller, not acutely pointed; M+Cu as long as R; veins black....... *ernstii* Schwarz.
a^2. Third antennal joint nearly four times as long as fourth, black; vertex and thoracic dorsum with conspicuous black spots and bands (or brown); M+Cu shorter than R.. *cedrelæ* Schwarz.

FREYSUILA DUGESII Aleman.

Figs. 122, 124, 408.

Frey-suila dugesii ALEMAN '87:21.
Freysuila dugesii SCHWARZ '97:197.—CRAWFORD '11b:491.

Length of body 3 mm.; length of forewing 4.8; width of head 0.95; length of antennæ 4. General color flavous; antennæ black on segments V–X, basal joints flavous.

Head broad, surface smooth or very finely punctate. Anterior ocellus in front at base of cleft; genæ produced beneath into a pair of small conical processes directed downward. Antennæ longer than body; I and II very large; III not quite twice as long as IV, fusiform, and very thick in the middle; IV to X more slender. Legs long, rather thick. Wings large, broadly rounded at apex; veins flavous; first marginal cell much larger than second. M+Cu shorter than R.

Genitalia.—*Female.*—Genital segment as long as rest of abdomen, about 1 mm. long; dorsal valve longer than ventral, acutely pointed; both valves with a tuft of long hairs near apex.

Described from two females from Guanajuato, Mexico (Duges), on *Cedrela* sp. These are two of the specimens sent by Mr. Duges to the United States National Museum some years ago, on which Schwarz based his description.

FREYSUILA ERNSTII Schwarz.

Freysuila dugesii ernstii SCHWARZ '97:197.

Very close to *dugesii*, differing in only a few respects; third antennal segment only a little longer than fourth; genæ swollen much less, processes not conical. Wings broader; M+Cu equal in length to R; pterostigma a little longer; veins black.

Genitalia.—*Male.*—Anal valve small, not longer than forceps, simple; forceps thick, cultrate, acute at apex, inner edge rather sharp.

Described from one male (paratype), from Caracas, Venezuela (A. Ernst), on *Cedrela*, April 20, 1894.

FREYSUILA CEDRELÆ Schwarz.

Fig. 417.

Freysuila dugesii cedrelæ SCHWARZ '97:197.

Close to *dugesii*, differing as follows: Color flavous, with a brown streak on each side of vertex, another behind each eye, extending to wing base; a brown spot on front of præscutum and a brown stripe on each side of scutum just above the wings; venter yellow; antennæ entirely black. Third antennal segment nearly four times as long as fourth; genal epiphyses acutely pointed. Wings large, as in *ernstii*, but with M+Cu shorter than R; veins black. Female genital segment much shorter than rest of abdomen.

Described from two females (paratypes), from Trinidad, West Indies (F. W. Urich), on *Cedrela odorata*, January 29, 1894.

Genus EPICARSA Crawford.

Epicarsa CRAWFORD, '11b: 488.

This genus is close to *Freysuila*, differing in the following characters: Head less deeply cleft in front; vertex only a little concave between posterior ocelli; frons narrow; genæ with a minute epiphysis beneath each antennal base; clypeus very small. Antennæ shorter than body, greatly thickened from base to tip. Hind tibiæ with a spur at base. Wings rounded; Rs and M almost touching; first marginal cell smaller than second; pterostigma wanting.

Type of genus.—Epicarsa corniculata Crawford.

EPICARSA CORNICULATA Crawford.

Figs. 152, 153, 157, 497.

Epicarsa corniculata CRAWFORD '11b: 488.

Length of body 1.9 mm.; length of forewing 2.5; width of head 0.75. General color dark brown or black; head and prothorax jet black; abdomen lighter; genitalia yellowish brown.

Head not deflexed, almost as broad as thorax, finely punctate; vertex elevated somewhat on postocellar regions, concave between posterior ocelli but less so than in preceding genus; with a conspicuous epiphysis near eye, over insertion of antennæ. Eyes rather large; posterior ocelli reniform in shape, situated well forward; anterior ocellus in front at apex of excision, visible from above. Antennæ about three times as long as width of head, very stout and thick; two basal segments very large; third about as long as first two together.

Thorax rather flattened; pronotum long, flat on dorsal surface; pleurites very large and long; pleural suture oblique, almost as long as episternum. Spur at base of hind tibiæ not very large, but conspicuous. Wings large, hyaline, shining, less than two and a half times as long as broad, quite broadly rounded at apex; first marginal cell much smaller than second; second very large; venation very distinctive (see figure); with a black band along M_3 and Rs; a black band, also, along Cu_1 and a third on R_1.

Genitalia.—Male.—Genital segment relatively rather small; forceps short and slender; anal valve small, simple.

Described from one male collected at Para, Brazil, by C. F. Baker. Type in author's collection.

Genus CARSIDARA Walker.

Carsidara Walker '69: 329.—Scott '82: 466.—Crawford '11b: 484.

Head very deeply cleft in front; vertex short, lobes diverging toward anterior margin of eyes; genæ large, composing anterior portion of what *appears* to be the vertex; front ocellus at end of median line of vertex, near the middle of the top of the head; genæ not produced below, as in *Freysuila;* frons mostly covered by genæ, sometimes slightly visible. Antennæ very long and slender. Beak long. Thorax not broad. Hind tibiæ with a large spur at base. Wings hyaline, angulate at apex, with a pterostigma.

Type of genus.—Carsidara marginalis Walker.

The four following species from the American tropics are very closely related to each other. This seems to be a tropical genus almost exclusively.

SYNOPSIS OF SPECIES.

a^1. Length to tip of folded wings about 5 mm.; head large, subglobose in profile. *gigantea* Crawford.
a^2. Length about 4 mm., or less.
  b^1. Thoracic dorsum conspicuously striped; length sometimes slightly over 4 mm. *dugesii* Loew.
  b^2. Thoracic dorsum pale, not striped, or at most very indistinctly so; size smaller.
    c^1. Color flavous; body surface not pluverulent.............. *mexicana* Crawford.
    c^2. Color whitish; body surface pulverulent; sometimes indistinctly striped on dorsum of thorax.. *concolor* Crawford.

CARSIDARA GIGANTEA Crawford.

Figs. 149, 151, 373, 492.

Carsidara gigantea Crawford '11b: 486.

Length of body 3 mm.; length of forewing 4.3; width of head 0.96. General color light yellowish brown; thoracic dorsum with yellowish or pale stripes; distal portions of antennal segments black. Body large.

Head not deflexed, finely punctate, not quite as broad as thorax, arcuate on posterior margin; vertex with a deep sulcate depression between posterior and anterior ocelli, and a lesser one extending outward on each side from anterior ocellus; anterior ocellus almost in the middle of the top of the head (vertex and genæ together); posterior ocelli situated well forward, almost in a line transversely with anterior ocellus. Clypeus very small, inconspicuous; beak very long; slender and acutely pointed. Antennæ fully as long as body, very slender.

Thorax long, rather large, punctate, striped. Propleurites large; pleural suture curved; præscutum long and rather broad. Basal spur on hind tibiæ large and conspicuous. Wings large, hyaline, shining, about two and three fourths times as long as broad, rather acute at apex; first marginal cell much smaller than second; pterostigmal space open, large, long.

Genitalia.—Female.—Genital segment very stout, relatively short, rather acute at apex; dorsal valve large, abruptly acute at apex; ventral valve more slender, equal in length to dorsal; pubescence rather dense and long.

Described from three females collected at Granada, Nicaragua, by C. F. Baker.

Type in author's collection.

CARSIDARA DUGESII Loew.

Figs. 148, 150, 374, 494.

Carsidara dugesii LOEW '86:160.
Carsidara rostrata CRAWFORD '11b:486.

Close to *gigantea*, but distinctly smaller; color light brown, striped similarly; vertex with sulcate depressions distinctly different (see figure). Second marginal cell of forewing relatively larger; pterostigma slightly thickened. Female genital segment more slender, with a longer, more slender, and upturned termination.

Described from three females (one not typically colored), from Chinandega, Nicaragua (C. F. Baker). Judging from the similarities in size, color, general appearance, and habitat, *rostrata* Crawford is probably identical with Loew's *dugesii*, which was described from Mexico (collector, A. Duges), on a species of Malvaceæ.

CARSIDARA MEXICANA Crawford.

Figs. 147, 160, 385, 496.

Carsidara mexicana CRAWFORD '11b:487.

Close to *dugesii* and possibly not a distinct species. Thoracic dorsum with no indication of stripes; color uniformly flavous or yellow. Vertex and thorax similar in structure and appearance; pterostigma of forewing not thickened as above.

Genitalia.—Male.—Anal valve large, almost as long as genital segment, with a short, large posterior lobe, somewhat as Loew figures for *dugesii*, but apical portion much shorter; forceps long, strongly curved, obtuse at apex; second pair of forceps shorter, very acutely pointed.

Described from one male from Acapulco, Mexico (C. F. Baker).

Type in author's collection.

CARSIDARA CONCOLOR Crawford.

Figs. 146, 159, 375, 495.

Carsidara concolor CRAWFORD '11b:484.

Similar to *dugesii*, but differing sharply in being whitish and more or less pulverulent; thoracic dorsum not or very indistinctly striped as in *dugesii;* size uniformly smaller; body and wings more slender; vertex with sulcate depressions much less marked and conspicuous. Female genitalia somewhat similar; male anal valve similar but with apical portion much shorter and broader.

Described from many males and females from Habana, Cuba (Baker).

Type in author's collection.

Genus RHINOPSYLLA Riley.

Rhinopsylla RILEY '83: 77.—CRAWFORD '11a: 440; '11b: 483.

Head often less deeply cleft in front than in preceding genera, though sometimes very deeply cleft; anterior ocellus in front, as in *Freysuila;* frons covered by genæ; genæ sometimes swollen (approaching *Kuwayama* of Triozinæ). Antennæ long. Thorax only slightly arched. Legs long and slender; hind tibiæ with a small spur at base, or often none. Wings *triozine,* with no cubital petiole (M + Cu) and no pterostigma, but resembling preceding genera somewhat also.

Type of genus—Rhinopsylla schwarzii Riley.

This is a very interesting genus, in that it grades into *Kuwayama* of the Triozinæ on the one hand, and other species grade into the preceding genera of Carsidarinæ on the other hand. There are unmistakable relationships to both subfamilies, but the most fundamental characters seem to indicate a closer relationship with the Carsidarinæ.

SYNOPSIS OF SPECIES.

a^1. Head very deeply cleft in front; eyes appearing as if stalked; forefemora (of male at least) greatly enlarged .... *schwarzii* Riley.

a^2. Head not very deeply cleft in front; forefemora not greatly enlarged.

  b^1. Legs extremely long and slender; tibiæ much longer than femora; head moderately deeply cleft; third antennal joint thickened.

    c^1. Head and thorax shining black, abdomen flavous; vertex smooth and shining, deeply concave between posterior ocelli; forefemora slightly enlarged. *athenæ*, new species.

    c^2. Color flavous; vertex punctate, deeply concave between posterior ocelli; forefemora scarcely enlarged .... *jalapensis* Crawford.

  b^2. Legs not unusually long; tibiæ only a little longer than femora; third antennal joint not thickened.

    c^1. Body black; head moderately deeply cleft in front; antennæ broad at base. *antennata* Crawford.

    c^2. Body orange to flavous; head not deeply cleft; antennæ smaller at base. *antennata proxima* Crawford.

RHINOPSYLLA SCHWARZII Riley.

Rhinopsylla schwarzii RILEY '83: 78.—CRAWFORD '11a: 441.

Length to tip of folded wings about 3 mm. General color dull reddish on head and thorax, abdomen greenish; femora red, tibiæ flavous; thoracic dorsum with indistinct pale stripes; antennæ pale on joints III to VI.

Head very deeply cleft in front, strongly birostrate; eyes appearing to be stalked because of this rostrate condition; antennæ very thick at base and increasing rostrate appearance; genæ scarcely swollen beneath antennal bases; third antennal segment distinctly thicker than succeeding joints, longer than IV and V combined; total length of antennæ more than twice width of head. Thorax slightly arched. Legs long, front pair longest; forefemora greatly enlarged in male (female not known), and curved strongly; hind tibiæ not spurred at base, but distinctly swollen. Wings more than three times as long as broad, acute at apex.

Genitalia obscured in both cotypes. Male genitalia very small.

Described from the two cotypes in the National Museum (together with Riley's original description). One of the specimens is all destroyed except the abdomen. Collected at Baldwin, Florida, by E. A. Schwarz, March 11, 1879, on "low plants in the cypress swamps".

RHINOPSYLLA ATHENÆ, new species.

Figs. 123, 409.

Length of body 1.9 mm; length of forewing 3; width of head 0.72. General color deep shining black on head, pronotum, and præscutum; rest of body flavous orange; antennæ black, except IV and V and tip of III white; male genitalia a little darker than rest of abdomen.

Somewhat similar to *schwarzii*, but head not so strongly birostrate, not so deeply cleft, not as broad as thorax; eyes hemispherical and directed somewhat forward (as in *schwarzii* also), but not giving the appearance of being stalked; antennæ somewhat similar, but third joint less swollen.

Thorax scarcely arched; pronotum rather long; præscutum small. Legs very long; forefemora larger than the second pair, but not so conspicuously enlarged as in *schwarzii;* tibiæ much longer than femora. Wings narrow, three times as long as broad, narrowly angulate at apex, venation rather similar.

Genitalia.—Male.—Anal valve rather small, broad in caudal view, somewhat extended caudad in lateral view; forceps small, cultrate, inner edge rather sharp, only a little arched.

Described from one male from Athens, Georgia (J. C. Bradley), June 15, 1909.

Type in the collection of Cornell University.

RHINOPSYLLA JALAPENSIS Crawford.

Figs. 154, 155, 178, 376, 408.

Rhinopsylla jalapensis CRAWFORD 11b:490.

Length of body 2.6 mm.; length of forewing 3.7; width of head 0.70. General color greenish brown.

Head not deflexed, scarcely as broad as thorax, arcuate on posterior margin; vertex with a deep sulcate depression on each side of median line extending obliquely toward outer margin of antennæ; anterior margin rather deeply cleft, but less so than in *athenæ;* anterior ocellus at apex of excision, visible from above; posterior ocelli situated well forward. Antennæ very long and slender, nearly as long as body, uniformly black; antennal bases swollen. Clypeus rather large; beak long and slender, acute.

Thorax arched, rather narrow, coarsely punctate. Præscutum long, rather narrow. Hind tibiæ with a small spur at base. Wings large, hyaline, acute at apex, about two and three-fourths times as long as broad; first marginal cell smaller than second.

Genitalia.—*Male.*—Genital segment large; forceps large, stout, obtuse at apex; anal valve long, spatulate; pubescence moderate. *Female.*—Genital segment almost as long as rest of abdomen, quite acute and slender; dorsal valve a little longer than ventral; pubescence rather sparse.

Described from several males and females from Jalapa, Mexico (Crawford), August 28, 1910.

Type in author's collection.

RHINOPSYLLA ANTENNATA Crawford.

Figs. 215, 333, 541.

Paratrioza antennata CRAWFORD 10a:229.
Rhinopsylla antennata CRAWFORD 11a:441; 11b:491.

Length of body 1.8 mm.; length of forewing 2.7; width of head 0.73. General color black, abdomen white ventrad; antennæ and tarsi lighter.

Head not deflexed, about as broad as thorax, broad posteriorly when viewed from the side, and tapering toward the insertion of the antennæ. Vertex arcuate on posterior margin, with a prominent sulcate depression extending forward and toward lower margin of eye on each side, rather deeply cleft in front; anterior ocellus at apex of excision, visible from above; genæ slightly swollen beneath antennal bases. Præscutum small. Legs not very long, as in preceding species. Wings hyaline, small, about two and a half times as long as broad, subacute apically; marginal cells subequal; venation light brown, inconspicuous.

Genitalia.—*Male.*—Genital segment small, not much larger than preceding segment; forceps small, subglobose basally, slender and acute apically; pubescence short and sparse. Anal valve about equal in size to ventral plate of segment, almost straight on inner margin, strongly arched posteriorly; pubescence longer than on genital plate and forceps.

Described from two males from Colorado (C. F. Baker), no data.

Type.—Cat. No. 18082, U. S. Nat. Mus.

RHINOPSYLLA ANTENNATA PROXIMA Crawford.

The chief variation from the species lies in the cephalic characters. The anterior emargination is less pronounced, and the basal segments of the antennæ are distinctly smaller, but of the same type. The sulcate depression on the vertex is more marked. The genal cones are entirely wanting, as in the other species of the genus, but the genæ are more globosely enlarged beneath the antennæ. The color is lighter in the varietal form, but this may be of no importance.

Described from one female collected in Colorado by C. F. Baker (no data).

Type in author's collection.

The varietal form approaches rather closely to species of *Kuwayama* (of Triozinæ) in the shape of the head, except for the anterior emargination, in which they are quite distinct from each other.

Subfamily CERIACREMINÆ.

This subfamily was created by Enderlein in 1910 ('**10**: 138) for a number of unrelated genera, some of which should be referred to Carsidarinæ and some to Psyllinæ. Two species only of the typical genus, *Ceriacremum*, are known in the New World fauna, and for these species Enderlein's subfamily name is retained. The limits of the subfamily, however, are very uncertain. The chief character upon which it stands is the presence in the forewing of one or more additional marginal cells, besides the usual two which are formed by the forking of the media and cubitus. The additional ones are formed either by the forking of the radial sector or by a cross vein between the latter and the medial vein.

This character is possessed by a dozen or more species, mostly tropical, but there are often wide differences between these species in other characters. It seems probable that this venational character, after further study of the tropical Psyllid fauna of the world, will prove to be valueless as a subfamily character. However, since only a few of these species are available for comparison at present, the most reasonable course to follow is to retain Enderlein's subfamily name for our two species, and to omit describing or designating the limits of the subfamily until more detailed study is possible. For the present, the description of the single New World genus, *Ceriacremum*, may suffice for the subfamily description.

Ceriacremum resembles members of Psyllinæ in cephalic and thoracic characters, having the frons completely covered by the genæ. *Phacopteron* Buckton ('**94**: 18) resembles *Ceriacremum* in venational characters, but differs widely in having the frons not covered by the genæ.

Anomoneura, a Japanese genus, is very anomalous in having the radial sector branched several times, thus forming several supernumerary marginal cells. In other respects it seems to be closely related to species of Psyllinæ.

Genus CERIACREMUM Enderlein.

Ceriacreumum ENDERLEIN '10a: 138.
Panisopelma ENDERLEIN '10b: 280.

Head rather large, not strongly deflexed; vertex broader than long, converging toward front; frons covered by genæ; genæ produced into cones of variable size. Antennæ long, slender. Hind tibiæ with a spur at base behind. Wings somewhat thickened, ovate, broadly rounded at apex, veins setigerous; radial sector branched apically and sending a short cross vein to media, thus making a third marginal cell.

Type of genus.—Ceriacremum filiverpatum Enderlein (an African species), designated by Enderlein ('**10**: 138).

SYNOPSIS OF SPECIES.

a^1. Genal cones very small; vertex twice as broad as long; antennæ half as long as forewing; length to tip of folded wings about 2 mm. . *quadrigibbiceps* Enderlein.
a^2. Genal cones two-thirds as long as vertex; vertex not quite twice as broad as long; antennæ as long as wings; length 3 mm to tip of folded wings *setosum*, new species.

CERIACREMUM QUADRIGIBBICEPS Enderlein.

Panisopelma quadrigibbiceps ENDERLEIN '10b:280.

The principal differences between this and the following species are mentioned in the foregoing synopsis. I have seen no specimens of this species.

Locality: Province of Mendoza, Pedregal, Argentina (Jensen-Harup), October 24, 1906 (one female).

Type in Stettin Zoological Museum.

CERIACREMUM SETOSUM, new species.

Figs. 37, 43, 220, 272, 278, 432.

Length of body 2.1 mm; length of forewing 2.1; width of head 0.91. General color brownish flavous. Body robust, quite large, finely and rather densely pubescent.

Head large, fully as broad as thorax, punctate, pubescent; vertex rather flat, with two slight depressions discally, scarcely elevated on postocellar regions, somewhat produced in front on each side of median line. Genal cones large, broad, continuing plane of vertex, almost horizontal, somewhat divergent, subacute at apex, pubescence very short.

Thorax arched, large, pubescent, punctate. Pronotum long, flat; mesopleurites extending forward almost to head. Præscutum long, broad, not as long as scutum. Hind tibiæ with a spur at base; all tibiæ with a conspicuous fringe of spines at apex. Wings large, broad, broadly rounded at apex, subhyaline, fumate in apical marginal area; about twice as long as broad; pterostigma large, long, darker than adjoining membrane, pubescent; first marginal cell very large; second marginal cell rectangular; all veins set biseriately with setæ, larger on basal and pterostigmal costa.

Genitalia.—Male.—Genital segment rather large; forceps relatively very large, directed cephalad, and as long as genital plate, with a dorsal vertical epiphysis; anal valve bi-dactylate; the lower dactyl staight, bidentate at tip; upper dactyl arcuate; base large. *Female.*—Genital segment rather small, acute at apex; dorsal valve distinctly larger and longer than ventral.

Described from three males and four females collected in Chinandega, Nicaragua, and Granada, Nicaragua, by C. F. Baker.

Type in author's collection.

Subfamily TRIOZINÆ.

Head more or less deflexed, seldom as broad as thorax; vertex usually subtriangular to semicircular in outline; genæ produced into conical or lobate processes, or sometimes only spherically swollen; frons covered by genæ, as in Psyllinæ, visible only as a minute sclerite bearing the front ocellus. Antennæ ten-segmented, variable in length. Eyes hemispherical. Thorax, typically, well arched; sclerites variable, as described for the genera. Hind tibiæ with three to four black spines at apex; basal tarsus of hind legs without claw-like spines present in Psyllinæ. Wings typically hyaline, elongate-ovate, more or less angulate at apex; cubital petiole (M+Cu) nearly always wanting, R, M and Cu arising together from the basal vein (see *Ceropsylla* and *Hemitrioza* for exceptions); pterostigma wanting.

The members of this subfamily bear a striking resemblance to species of *Psylla*, but differ sharply in several respects: The more slender body (usually), the absence of the "claws" on the basal tarsi of the hind legs, the differently shaped wings and the different venation of same. The presence or absence, and the number, of spines on the hind tibiæ and the basal tarsus of the hind legs seem to be very constant characters, although not heretofore used, and very valuable for classification.

SYNOPSIS OF GENERA.

a^1. Media and cubitus never with a petiole, the three veins (radius, media, and cubitus) arising at same point from basal vein.

b^1. Genæ not produced into cones but more or less swollen spherically beneath base of antennæ .... *Kuwayama* Crawford.

b^2. Genæ produced more or less conically beneath antennæ.
  c^1. Pronotum long, flat, not at all depressed below level of præscutum and vertex, with an acute epiphysis in center of front margin, and a similar one on front margin of præscutum; notum nearly or quite flat; forewings nearly or quite three times as long as broad, often maculated.......*Leuronota*, new genus.
  c^2. Pronotum shorter, distinctly descending cephalad, depressed below head and præscutum; notum more strongly arched.
    d^1. Genal cones short and small; clypeus easily visible from front; vertex often conspicuously colored or banded....................*Paratrioza* Crawford.
    d^2. Genal cones at least moderately long, or not exceedingly short; clypeus not visible from front.
      e^1. Thorax broader than width of head including eyes; genal cones more or less divergent, variable in length, acute to subacute at apex. *Trioza* Förster.
      e^2. Thorax narrower than width of head, or not broader; genal cones long, slender, acute, closely appressed and not at all divergent; hind tibiæ with three apical spines within..................*Neotriozella* Crawford.
a^2. Media and cubitus with a short petiole, or showing a distinct tendency toward such a character, variable.
  b^1. Forewings elongate, nearly or fully three times as long as broad; R+M+Cu relatively long; M+Cu petiole short or subobsolete, rather constant within a species; hind tibiæ with two apical spines within........ *Ceropsylla* Riley.
  b^2. Forewings short, about twice as long as broad; M+Cu petiole variable within a species from long to obsolete (variable even on same individual); hind tibiæ with three apical spines within......................*Hemitrioza*, new genus.

Genus KUWAYAMA Crawford.

Epitrioza CRAWFORD (not Kuwayama) '11a: 452.
Kuwayama CRAWFORD '11b:

Head small, scarcely deflexed; notum rather flat, not arched; genæ not produced into cones, but swollen more or less spherically beneath bases of antennæ; clypeus large, easily visible from in front. Thorax as broad as, or broader than, head including eyes; pronotum usually not depressed below head and præscutum. Forewings subacute to acute at apex; venation as in *Trioza;* base of Cu relatively short.

Type of genus.—*Kuwayama medicaginis* Crawford.

This genus is rather closely related to *Paratrioza*, as shown especially by *K. dorsalis*. The form of the genæ, however, easily separates the two genera.

SYNOPSIS OF SPECIES.

a^1. Vertex rather deeply excised on each side of median line on top, margins not sharply differentiated; color of body light.
  b^1. Body small, wings less than 2.5 mm. long; antennæ scarcely twice as long as width of head; genital segment of female about half as long as rest of abdomen. *medicaginis* Crawford.
  b^2. Body larger, wings more than 3 mm. long; antennæ much more than twice as long as width of head; female genital segment nearly as long as rest of abdomen. *oaxacensis* Crawford.
a^2. Vertex not excised, almost flat, with margins sharply differentiated and giving vertex appearance of being raised plate-like. Color of body dark; forewings acute at apex; notum very flat..........................*dorsalis*, new species.

KUWAYAMA MEDICAGINIS Crawford.

Figs. 204, 208, 346, 393, 537.

Paratrioza medicaginis CRAWFORD '10a: 229.
Epitrioza medicaginis CRAWFORD '11a: 452.

Length of body 1.7 mm.; length of forewing 2.6; width of head 0.68. General color yellowish-green throughout. Body small, slender.

Head scarcely deflexed, small, not quite as broad as thorax, somewhat punctate. Posterior margin of vertex arcuate; discal area with a distinct foveal depression on each side of median line; anterior margin somewhat emarginate at median line above front ocellus. Genæ swollen into two rather large globose lobes extending vertically downward, slightly visible from side, slightly pubescent. Clypeus large, prominent below genal lobes from in front.

Thorax small, not strongly arched, quite coarsely punctate; pronotum short; præscutum ascending, rather small. Wings small, hyaline, sometimes faintly coriaceous, less than three times as long as broad, subacute at apex; marginal cells subequal.

Genitalia.—*Male.*—Genital segment moderately large, rounded; forceps deeply divided, bilobate or bicuspidate; the posterior process longer than anterior, more acute and glabrous; remainder of forceps surface sparsely pubescent; anal valve rather large, broad at base, more slender distally and terminating in a uniformly tapering epiphysis, sparsely pubescent. *Female.*—Genital segment moderately large, both valves of almost equal length, rather acute at apex, sparsely pubescent.

Described from several males and females from Colorado (Cockerell), on alfalfa; El Centro, California (J. C. Bridwell), on the same plant, *Medicago sativa*. One female specimen from Jalapa, Mexico (Crawford), seems to represent a species close to *medicaginis*, or possibly identical, but until the male is known it had better remain undescribed.

Type in author's collection.

KUWAYAMA OAXACENSIS Crawford.

Figs. 203, 347, 540.

Epitrioza oaxacensis CRAWFORD '11a: 453.

Length of body 1.9 mm.; length of forewing 3.3; width of head 0.70. General color light green with a tinge of yellow.

Head scarcely deflexed, small, punctate; vertex somewhat as in preceding species, but foveal depressions different in shape, arcuate on posterior margin and emarginate in front at median line. Genal lobes globose, very slightly angulated on inner margin, somewhat visible from side, sparsely pubescent. Clypeus visible from in front, rather large.

Thorax somewhat arched, broader than head including eyes, rather coarsely punctate. Præscutum longer than in preceding species, relatively narrower, rounded cephalad. Wings rather large, hyaline about two and a half times as long as broad, rounded apically or very broadly angulate; marginal cells subequal; one specimen presents the anomaly of the furcation distally of the radial sector of both primary wings.

Genitalia.—Female.—Genital segment long, slender, about as long as rest of abdomen; dorsal valve slightly longer than ventral, equally acute but less slender; pubescence sparse and short.

Described from four females from Oaxaca, Mexico (Crawford), August 10, 1910.

Type specimen in author's collection.

KUWAYAMA DORSALIS, new species.

Fig. 415.

Length of body 1.8 mm.; length of forewing 2.9; width of head 0.70. General color chocolate brown on dorsal surface of head, thorax, and abdomen; lighter on pleural and ventral regions and on legs; dorsal surface smooth.

Head almost as broad as thorax, not deflexed; vertex about twice as broad as long, with a foveal depression near posterior margin on each side of median line, anterior and lateral margins sharply defined, somewhat elevated. Genæ subspherically swollen beneath antennal bases. Clypeus large. (Flagellum of antennæ broken off.)

Thorax only a little arched; pronotum very short; præscutum ascending, long. Forewings hyaline, acute at apex, more than two and a half times as long as broad; marginal cells small; radial sector short.

Genitalia.—Male.—Genitalia small; forceps slender, almost as long as anal valve, acute at apex; viewed from behind, with apical half much narrower, flattened laterally, basal portion thick with a small inner process. Anal valve with a large posterior lobe, reaching nearly to base of forceps.

Described from one male from Tucson, Arizona (H. G. Hubbard), December.

Type.—Cat. No. 18080, U. S. Nat. Mus.

In some respects this species seems to be closely related to members of *Paratrioza.*

LEURONOTA, new genus.

Head not as broad as thorax, scarcely deflexed; notum almost flat, scarcely arched; genal processes conical, divergent. Antennæ more than twice as long as width of head, slender. Pronotum long, flat, not descending cephalad, produced in the center of the anterior margin into an acute epiphysis, on same level with præscutum and vertex. Præscutum rather flat, with an epiphysis corresponding to that of pronotum. Forewings long and slender, nearly or quite three times as long as broad, more or less acute at apex, often maculated. Hind tibiæ with two apical spines on inside.

Type of genus.—*Leuronota maculata* Crawford.

This genus is erected to include two of the species formerly placed in *Allotrioza,* now in synonymy. The character of the pronotum is still used somewhat as it was in *Allotrioza,* but it is more restricted and more sharply differentiated from the usual type in *Trioza.*

SYNOPSIS OF SPECIES.

a^1. Forewings conspicuously maculated, fully three times as long as broad.
  b^1. Genal cones descending; vertex with a deep fovea on each side of median line; dorsum slightly arched; wings three times as long as broad. *maculata* Crawford.
  b^2. Genal cones extending forward in same plane with vertex; vertex almost flat; dorsum scarcely arched; wings more than three times as long as broad, very narrow.. *longipennis,* new species.
a^2. Forewings not, or indistinctly, maculated, slightly less than three times as long as broad; genal cones descending...................... *acutipennis* Crawford.

LEURONOTA MACULATA Crawford.

Figs. 180, 181, 352, 510.

Trioza maculata CRAWFORD '10b : 349.
Allotrioza maculata CRAWFORD '11a : 446.

Length of body 2.3 mm.; length of forewing 3.1. General color greenish white to light brown; abdomen dorsally dark brown, ventrally mottled with brown; forewings maculated with brown.

Head not quite as broad as thorax, finely punctate; vertex emarginate on posterior margin in front of pronotal epiphysis, with a prominent foveal depression on each side of median line; genal cones not quite as long as vertex, descending somewhat, abruptly smaller and more divergent in apical half, subacute at apex, pubescent. Clypeus moderately large, visible from in front. Antennæ about two and a half times as long as width of head, slender; segments tipped with brown, apical segment entirely brown.

Thorax only slightly arched, more coarsely punctate than head. Pronotum one-third as long as præscutum, anterior epiphysis conspicuous; pleurites large; præscutum slightly broader than long, as long as scutum, with a short epiphysis on anterior margin in center; scutum with three indistinct stripes. Legs slender. Wings hyaline, three times as long as broad, subacute at apex, with a large brown macula covering most of posterior apical half and often extending to basal half; radial sector short; first marginal cell larger than second.

Genitalia.—*Male.*—Genital segment moderately large; anal valve large, simple, fusiform in lateral aspect, much longer than forceps, pubescent; forceps broadest at base, curved forward, acute at apex and tapering thereto from base. *Female.*—Genital segment nearly half as long as rest of abdomen, roundly acute at apex, thick dorsoventrally, pubescent, dorsal valve slightly longer than ventral.

Described from 19 males and females from: San Diego, Texas (Jones and Pratt), on *Condalia obovata,* March 25, 1908; Rockport, Texas (Schwarz), on *Columbrina texana,* August; Wades, Texas (Schwarz), May; Brownsville, Texas (Schwarz), June; Hot Springs, Arizona (Barber and Schwarz), June; Arizona (Baker).

Type in author's collection.

LEURONOTA ACUTIPENNIS Crawford.

Figs. 186, 512.

Trioza acutipennis CRAWFORD '10b: 350.
Allotrioza acutipennis CRAWFORD '11a: 446.
Trioza crawfordi AULMANN '13: 44.

Length of body 2.7 mm.; length of forewing 3.5; width of head 0.72. General color yellowish brown; scutum with five brownish stripes.

Head almost as broad as thorax, finely rugoso-punctate; vertex emarginate on posterior margin, as in *maculata,* with a foveal depression on each side of median line. Genal cones not quite as long as vertex, descending somewhat, divergent, subacute, sparsely pubescent. (Antennæ destroyed.)

Thorax slightly arched, more coarsely rugulose than head. Pronotum one-third as long as præscutum, anterior epiphysis conspicuous, lateral foveæ black; pleurites large; præscutum longer than in *maculata,* about as long as broad, with a conspicuous epiphysis in middle of front margin fitting into an emargination on hind margin of pronotum. Wings hyaline, about two and four-fifths times as long as broad, acute at apex, with several very light brown and indistinct maculæ, one in inner basal cell beside Cu_2, another extending through first marginal cell to M, a third at tip of wing in second marginal cell; radial sector longer than media.

Genitalia.—*Male.*—Genital segment one-fourth as long as rest of abdomen; forceps bilobate, with a projecting lobe extending posteriorly; anal valve and forceps thickly pubescent.

Described from one male collected at Chinandega, Nicaragua (C. F. Baker). The abdomen has been broken off since the original description of the species.

Type specimen in author's collection.

LEURONOTA LONGIPENNIS, new species.

Figs. 141, 405.

Length of body 2.8 mm; length of forewing 3.1; width of head 0.68. General color brown; genal cones, anterior margin of pronotum, part of sternum, legs, antennæ except terminal segment very light brown; antennal segments tipped with brown.

Head small, flattened, not deflexed, not as broad as thorax; vertex flat, with a broad, shallow depression on each side of median line, smooth; genal cones about two-thirds as long as vertex, extending forward in same plane with vertex, divergent, subacute at apex, slightly pubescent. Clypeus far back, with a conspicuous cavity in front of it between genæ. Antennæ more than three times as long as width of head, slender.

Thorax not arched, flat, narrow; pronotum moderately long, anterior epiphysis smaller than in two preceding species. Legs slender. Wings nearly four times as long as broad, very narrow, narrowly rounded at apex, apical third brown, basal two-thirds transparent, membrane coarsely punctate; first marginal cell larger than second; radial sector long.

Genitalia.—*Male.*—Genital segment small; anal valve much longer than forceps, fusiform, narrow at apex, with processes; forceps small, short, slender, acute at tip, strongly arcuate; pubescence short.

Described from one male from Palm Beach, Florida (H. G. Dyar), no data.

Type.—Cat. No. 18081, U. S. Nat. Mus.

This species bears some resemblance to members of the European genus *Floria.*

Genus PARATRIOZA Crawford.

Head more or less deflexed; vertex distinctly raised plate-like, with margins sharply defined, sometimes briefly pubescent, and sometimes variegated in color (as in *cockerelli*); genal cones short, often very short, acute, directed forward and outward; anterior ocellus best visible from in front, beneath slightly overhanging vertex. Antennæ slender. Clypeus large, easily visible from in front. Dorsum of thorax not strongly arched. Wings membranous, usually more than two and a half times as long as broad. Hind tibiæ with two apical spines on inner side, and sometimes a spur at base.

Type of genus.—*Paratrioza cockerelli* Sulc.

SYNOPSIS OF SPECIES.

a^1. Wings maculated, acute at apex; radial sector short and straight; second marginal cell much smaller than first; vertex and notum not conspicuously striped and banded..*maculipennis* Crawford.

a^2. Wings not maculated, subacute at apex; Rs long and curved.

- b^1. Body large; length to tip of folded wings at least 4 mm; vertex and notum not or only slightly variegated; hind tibiæ with large spines at apex and a small spur at base; wings large; first marginal cell larger than second. *arbolensis* Crawford.
- b^2. Body small; length to tip of wings only 3 mm; vertex and notum very conspicuously striped and banded with white or yellow; hind tibiæ with small apical spines and no basal spur; wings small, marginal cells subequal. *cockerelli* Sulc.

PARATRIOZA COCKERELLI Sulc.

Figs. 211, 330, 331, 348, 535, 536.

Trioza cockerelli SULC '09a: 102–108.
Paratrioza cockerelli CRAWFORD '11a: 448; PATCH '12: 321.
Paratrioza pulchella CRAWFORD '10a: 229.
P. ocellata CRAWFORD '11a: 447.
The Tomato Psyllid, JOHNSON '11: (?).

Length of body, average, 1.4 mm; length of forewing 2.7; width of head 0.52 to 0.70. General color light to dark brown (to unaided eye); head and thorax conspicuously striped and banded with white or yellow; vertex black, with a whitish or yellow band bordering it, and a white to yellow crescentic macula in center of discal area of variable size; pronotum white to yellow on posterior side; præscutum with a white stripe along median dorsal line and a horse-shoe-shaped band laterad; scutum with a stripe on each side of median dorsal line and an arcuate band laterad; pleuræ more or less variegated, legs and antennæ brown.

Head deflexed, nearly as broad as thorax, finely punctate; margins of vertex distinctly raised and sharply defined; discal impressions small. Genal cones very small, acute, divergent, projecting forward or slightly outward, seldom downward, pubescent. Antennæ not over twice as long as width of head, slender, with a peculiar sense organ on segment IV. Clypeus large.

Thorax arched, punctate. Pronotum descending cephalad below posterior margin of vertex. Praescutum roundly acute cephalad. Wings small, hyaline, about two and three-fourths times as long as broad, subacute at apex; Rs moderately long, flexed subapically; M and Cu long; marginal cells subequal.

Genitalia.—*Male.*—Genital segment rather small; forceps relatively long, somewhat scythe-shaped when viewed either from side or rear; anal valve reaching higher than forceps, produced posteriorly on each side into a lobe which varies in size and shape from long and slender to very broad at base and triangular in shape. *Female.*—Genital segment very short and small, subacute; dorsal valve about as long as preceding tergite; anal pore large; pubescence sparse.

Described from numerous males and females from the following localities: Boulder, Colorado (Cockerell), on pepper (*Capsicum annuum*), topotypes; Rocky Ford, Colorado (McMillan), on tomato (*Solanum nigrum*), September, 1910; Cañon City, Colorado (Gravestock), on tomatoes, October, 1894; Colorado (Gillette, Baker), no data given; Park City, Utah (Hubbard and Schwarz); Milford, Utah (J. C. Bradley), September, 1908; Williams, Arizona (Barber and Schwarz), on *Purshia* and Arbor-vitæ, May and July; Tucson, Arizona (Hubbard), December; Fort Yuma, Arizona (Hubbard), January; Madagascar Mountains, New Mexico (Snow), August, 1894;

and thorax. The young take from four to five weeks to mature, and breed throughout the summer.

The fall brood probably lay their eggs in the crevices of the bark and twigs. These hatch at the first appearance of spring and feed on the tender new shoots and leaves, and are those found fully matured by the first or second week in April.

The larva is fringed on the margins with long hairs, as in other species of *Trioza*.

TRIOZA MEXICANA Crawford.

Figs. 210, 340, 389, 531.

Trioza mexicana CRAWFORD '11a:439.

Length of body (female) 2.6 mm; length of forewing 3.6; width of head 0.87. General color reddish brown, usually dark, occasionally lighter; head lighter than thorax; antennæ whitish on basal third, remainder black. Vertex and notum slightly pubescent.

Head not as broad as thorax; vertex more than half as long as broad, with a very shallow depression on each side of median line, rounded down in front toward genal cones; cones nearly or fully as long as vertex, rather slender, acute, not very divergent. Antennæ about one and a half times as long as width of head, slender.

Thorax strongly arched, punctate, pubescent slightly. Pronotum long. Hind tibiæ with three apical spines within. Wings dusky, membrane covered entirely with fine punctural dots; veins set with a double row of setæ; less than two and a half times as long as broad, broadly rounded at apex.

Genitalia.—*Male.*—Anal valve large, long, front margin straight, hind margin very arcuately rounded caudad, apex short; forceps long, sides subparallel except subapically, apex abruptly broadened, black. *Female.*—Genital segment almost as long as rest of abdomen; dorsal valve longer than ventral, both slender and acuminate in apical portion, margin slightly serrate.

Described from several males and females collected on a species of *Rhus* in the mountains near Cuernavaca, Mexico, altitude 10,000 feet (Crawford).

Type in author's collection.

TRIOZA MEXICANA MINUTA Crawford.

Body distinctly smaller than in the species. Head similar. Pronotum comparatively shorter. Wings smaller, less dusky; setæ on veins smaller and less prominent; venational characters similar. Genitalia similar, smaller in male.

Described from three females and one male from Oaxaca, Mexico (Crawford), no other data.

Type in author's collection.

TRIOZA PROXIMATA Crawford.

Figs. 388, 529.

Trioza proximata CRAWFORD '11a:435.

Length of body (female) 3.4 mm; (male) 2.4; length of forewing 3.7; width of head 0.78. General color light greenish yellow; ovipositor of female black; antennæ black apically.

Head small, much narrower than thorax; vertex a little more than half as long as broad, somewhat bulging in front on each side of median line, with a deep foveal impression posteriorly on each side; genal cones short, half as long as vertex, only slightly divergent, subacute, pubescent. Antennæ about twice as long as width of head.

Thorax large, broad, strongly arched, punctate; pronotum rather short, strongly descending cephalad; propleurites broad. Præscutum very narrowly rounded cephalad. Mesonotum long. Hind tibiæ with three apical spines within. Wings about two and a half times as long as broad, broadly rounded at apex; Rs very olong.

Genitalia.—*Male.*—Genital segment large. Anal valve about as long as forceps, triangular in outline, posterior margin angulately arcuate, anus on an epiphysis; forceps long, curved cephalad, and arcuate toward each other, rather slender, acutely pointed at apex, with two ridges of hairs on inner surface. Penis long. *Female.*—Genital segment very elongate and styliform except at base, nearly three-fourths as long as rest of body; base large, subglobose; apical two-thirds styliform, very slender and acuminate, dorsal valve longer than ventral. Pubescence short.

Described from several males and females from Oaxaca and Orizaba, Mexico (Crawford), August, 1910. No host plant data.

Type in author's collection.

TRIOZA COLLARIS Crawford.

Figs. 185, 187, 350, 509.

Trioza collaris CRAWFORD '10b:347; '11a:436.—PATCH '12b:225.

Length of body (female) 2.5 mm; length of forewing 3.7; width of head 0.72. General color greenish yellow; notum more or less streaked with brown; abdomen darker dorsad.

Very similar in most respects to *proximata*, differing as follows: Antennæ only about one and a half times as long as width of head; præscutum more broadly rounded cephalad; wings less broadly rounded at apex, sometimes subacute. Female genital segment not over half as long as rest of body, usually less than half; styliform prolongation not, or only a little, longer than basal portion. Male genitalia similar, but anal valve roundly arcuate behind, not angulately; forceps similar.

Claremont, California, Mountains (Crawford), on a species of Spruce, June, 1911, found in myriads infesting the twigs and needles; El Centro, California (J. C. Bridwell), on alfalfa; San Luis Obispo, California (Condit), on "green-house tomatoes," September, 1909; Argus Mountains, on *Pinus monophylla*, and Death Valley, California (Koebele), May; Alameda, California (Koebele), September.

Food plants: Pepper (*Capsicum annuum*), tomato (*Solanum nigrum*), potato (*Solanum tuberosum*), *Purshia* sp., arbor-vitæ (*Thuja occidentalis*), spruce (*Picea* sp.), pine (*Pinus monophylla*), alfalfa (*Medicago sativa*). Some of these plants may not be true food plants. This is a species easily distinguished from all others by the striking coloration of the body. Its distribution seems to be general throughout the southwestern United States and is often found in great numbers, sometimes becoming a pest to cultivated plants. Since describing *P. ocellata* (Crawford **'11a**: 447) as a new species closely related to *cockerelli*, I have had an opportunity to examine many more specimens from many localities, and have come to the conclusion that all these represent but one species more or less variable in some respects. The variation in degree of coloration is so marked and continuous that it seems useless to try to distinguish the varietal forms *nigra* and *flava*.

PARATRIOZA ARBOLENSIS Crawford.

Figs. 197, 200, 207, 345, 391, 532.

Paratrioza arbolensis CRAWFORD **'10a:229**.
Allotrioza arbolensis CRAWFORD **'11a:444**.—PATCH **'12:231**.

Length of body 2.6 mm; length of forewing 3.9; width of head 0.96. General color light green throughout. Body very large.

Head a little deflexed, very large, punctate; vertex arcuate on posterior margin, front margin sharply defined, with a deep fovea on each side of median line discally and a marked depression diverging toward insertion of antennæ with a prominent elevation on each side of median line between depressions. Eyes very large. Genal cones short, horizontal. Extending outward, subacute at apex, moderately pubescent. Antennæ large basally. Clypeus very large, easily visible from in front.

Thorax large and broad, slightly broader than head including eyes, more coarsely punctate than vertex. Pronotum rather long, somewhat depressed below head and præscutum; latter long and broad, rather triangular, narrow cephalad. Legs large; hind tibiæ with large spines at apex and a distinct spur at base; claws large. Wings hyaline, large, straight on hind margin, front margin arched, not quite three times as long as broad.

Genitalia.—*Male.*—Forceps rather large at base, subacute at apex; anal valve small, simple. *Female.*—Genital segment rather small, scarcely longer than two preceding ventral sclerites; dorsal valve longer than ventral, acutely pointed; ventral valve acute; pubescence sparse.

Described from three males and four females from Arboles, Colorado (C. F. Baker), on *Shepherdia* sp.

Type in author's collection.

In the preliminary synopsis of Triozinæ (Crawford **'10a**: 229) this species was included in the genus *Paratrioza*. In a later paper it was removed and made the type of a new genus on the basis, principally, of the larger pronotum. After further study, it seems that this species is not distinct generically, and therefore it is returned to *Paratrioza*, and *Allotrioza* is sunk into synonymy. The other species of the latter genus are placed in other genera.

PARATRIOZA MACULIPENNIS Crawford.

Fig. 392.

Trioza maculipennis CRAWFORD '10a : 237.
Paratrioza maculipennis CRAWFORD '11a : 450.

Length of body 1.7 mm; length of forewing 2.85; width of head 0.77. General color reddish brown to dark brown or black; vertex fulvous brown, margin and discal area usually lighter; thorax darker, somewhat mottled; notum more or less striped; abdomen dark; antennæ black at tip, intermediate segments tipped with black.

Head deflexed, almost as broad as thorax; vertex flat, with a shallow depression on each side of median line, pubescent; genal cones short, longer than in *cockerelli*, directed forward and outward, acute, pubescent. Antennæ fully twice as long as width of head, slender.

Thorax not strongly arched, coarsely punctate, slightly pubescent. Pronotum rather short, descending cephalad; præscutum broader than long. Legs moderately long; apical spines on hind tibiæ rather large; basal spur small or wanting. Wings acute at apex, posterior margin somewhat angled, front margin strongly arched, about two and two-thirds times as long as broad, with several brown maculæ in apical half covering both marginal cells and parts of other cells; Rs short and straight; first marginal cell distinctly larger than second.

Genitalia.—*Male.*—Anal valve relatively large, with a long posterior process reaching over forceps, somewhat as in *cockerelli;* forceps small, short, acute at apex. *Female.*—Genital segment short, about as long as preceding ventral sclerite, subacute at apex, dorsal valve a little longer than ventral.

Described from two males from San Mateo County, California (C. F. Baker), and 17 males and females from the following localities: Sacramento, California (A. Koebele), on *Convolvulus occidentalis*, July; Folsom, California (Koebele), on same host, August; Ukiah (?), California (I. J. Condit), on *Convolvulus arvensis*, Septem, ber; Placer County, California (Koebele), on *Ceanothus cordulatus*, September; Stanford University, California (Crawford), on *Salix* sp., February (probably only migrants).

Type in author's collection.

Genus TRIOZA Förster.

Head not broader than thorax, usually distinctly narrower, deflexed; vertex much broader than long, with more or less of an emargination in front between the two lobes; genal cones variable in length, shape, and trend, usually subacute, always more or less divergent. Clypeus subglobose or pyriform, scarcely visible from in front. Eyes large, hemispherical. Antennæ slender, from one to two and a half times as long as width of head.

Thorax usually arched rather strongly; pronotum short, descending cephalad quite strongly, depressed below level of head and præscutum; propleurites as in *Psylla;* epimeron usually shorter than episternum; pleural suture oblique, not extending to middle of lateral extremity of pronotum, as is the case in *Aphalara*. Præscutum usually about as long as broad, narrowed conspicuously cephalad. Legs usually slender; hind tibiæ with two or three black spines at apex on inner side and one outside. Wings hyaline, membranous; radius, media, and cubitus diverging at same point from basal vein (R+M+Cu), and cubital petiole (M+Cu) wanting.

Type of genus.—Trioza urticæ Linnæus. Apparently no species has yet been designated as the type of this genus. Because *urticæ* is both typical and one of the first known species, it is here designated as the type.

This is a very large genus and many of its species are difficult to distinguish, as is usually the case in large genera. The same is true of *Psylla* and *Aphalara*. Under this generic name there have been described a number of species which differ sufficiently to warrant the erection of other genera for them. The synopsis of species presented in a former paper (Crawford '11a) has been entirely made over and is now much more usable than before. All the species described from America have been included so far as possible, so that it is also much more complete than before.

Descriptions of the genus, as formerly defined, may be found in Scott 76:551, and Froggatt '01:273. Synopses of genera, including *Trioza*, have appeared in several papers, as in Loew '78:609; Maskell '89:164; Crawford '11a:423. The genus is redefined here, however, and the descriptions of both genus and species are based on some characters not heretofore used.

SYNOPSIS OF SPECIES.

a^1. Posterior tibiæ with three black spines on inner side, and one outside; pronotum usually long.

b^1. Antennæ not longer than width of head; body large, robust; wings large.

c^1. Vertex and notum with short pubescence; vertex light colored, rather flat, not coarsely punctate.......................................*bakeri* Crawford.

c^2. Vertex and notum not pubescent; vertex black, bulging lobately in front, very coarsely punctate...............................*breviantennata*, new species.

b^2. Antennæ distinctly longer than width of head, seldom more than twice as long.

c^1. Vertex and thoracic dorsum more or less pubescent.

d^1. Pubescence long, prominent; wing veins without setæ; membrane of wings transparent; second marginal cell unusually large; genal cones about half as long as vertex.......................................*diospyri* Ashmead.

d^2. Pubescence very short; wing veins with conspicuous setæ; membrane darkened by numerous punctural dots; second marginal cell not unusually large; genal cones as long as vertex.

e^1. Body large; wings smoky or fulvous; setæ on veins prominent.
mexicana Crawford.

e^2. Body rather small; wings only slightly fulvous; setæ not prominent.
mexicana minuta Crawford.

c^2. Dorsum of thorax not pubescent.

d^1. Genal cones not or scarcely more than half as long as vertex, not strongly divergent; female genital segment very elongate and styliform.

e^1. Female genital segment three-fourths as long as rest of body; styliform prolongation more than twice as long as basal portion; posterior margin of male anal valve angulate; antennæ twice width of head.
proximata Crawford.

e^2. Female genital segment not over half as long as rest of body; styliform prolongation one to one and a half times as long as basal portion; posterior margin of male anal valve arcuately rounded; antennæ less than twice width of head.

f^1. Clypeus very large; styliform prolongation of female genital segment usually much longer than basal portion; genal cones bluntly rounded.....................................*longistylus* Crawford.

f^2. Clypeus not large; styliform prolongation of female genital segment usually not longer than basal portion (sometimes longer); genal cones acute at apex....................................*collaris* Crawford.

d^2. Genal cones more than half as long as vertex, more divergent; female genital segment not styliform.

e^1. Forewing with four brown maculæ on posterior margin; costal margin strongly arched; Rs short; genal cones rather short, scarcely two-thirds as long as vertex...........................*quadripunctata* Crawford.

e^2. Forewings without four such maculæ; genal cones at least two-thirds as long as vertex.

f^1. Antennæ nearly or quite twice as long as width of head; forewings broadly rounded at apex; Rs short, straight; legs very slender; genal cones about two-thirds as long as vertex; hind tibiæ occasionally with only two spines at apex inside..................*albifrons* Crawford.

f^2. Antennæ not over one and a half times width of head; wings not broadly rounded; Rs longer; genal cones often as long as vertex; legs not always slender.

g^1. Antennæ one and a half times width of head; vertex not or scarcely pubescent; posterior lobe of male anal valve large (fig. 358).

$h.^1$ Body brownish red to orange; thorax strongly arched; dorsum not pubescent.................................*frontalis* Crawford.

h^2. Body dark reddish brown; thorax less strongly arched; dorsum with slight and inconspicuous pubescence.
frontalis sulcata Crawford.

g^2. Antennæ one and one-fourth times width of head; vertex distinctly pubescent; posterior lobe of male anal valve smaller, more slender.
obtusa Patch.

a^2. Posterior tibiæ with two black spines on inner side and one outside; pronotum usually shorter.

b^1. Forewings more or less maculated or banded.

c^1. Notum distinctly pubescent; maculation of wings very extensive and conspicuous.. *lobata*, new species.

c^2. Notum not pubescent; maculation much less extensive.

d^1. Media and cubitus bordered with a dark band; marginal cells darkened; Rs long and curved; female genital segment rather long; anal valve of male obtriangular.................................... *tripunctata* Fitch.

d^2. Posterior margin darkened from tip of clavus to tip of wing and through both marginal cells; Rs short, straight; female genital segment short; male anal valve small, with a rectangular posterior lobe.
arizonæ Aulmann.

b^2. Forewings not maculated or banded.

c^1. Præscutum not distinctly longer than broad.

d^1. Antennæ not over twice as long as width of head.

e^1. Genal cones usually fully or very nearly as long as vertex (sometimes scarcely over two-thirds as long), divergent, acute to subacute; Rs long and curved.

f^1. Forewings very broadly rounded at apex; thorax and vertex often more or less conspicuously striped or banded with yellowish white on a dark ground color.............................. *varians* Crawford.

f^2. Forewings more or less angulate at apex, not broadly rounded; thorax and vertex not as above.

g^1. Vertex conspicuously bulging forward; male anal valve with posterior lobes short; female genital segment usually moderately long, sometimes short....................................... *salicis* Mally.

g^2. Vertex not conspicuously bulging forward; female genital segment very short, not longer than preceding ventral sclerite; genal cones not very slender; forewings usually (not always) fulvous; vertex without deep sulcus............................ *maura* Förster.

e^2. Genal cones not over two-thirds as long as vertex, or less.

f^1. Forewings short, seldom over 2.5 mm. long; body small.

g^1. Genital segment of female short, less than half as long as rest of abdomen; genal cones short, about half as long as vertex.
salicis Mally.

g^2. Genital segment of female nearly or fully as long as rest of abdomen; genal cones two-thirds as long as vertex.

h^1. Female genital segment with a short styliform prolongation, very acute; clypeus small.................... *nicaraguensis* Crawford.

h^2. Female genital segment without styliform prolongation; dorsal valve longer than ventral, acute; wings sometimes 2.8 mm. long; male forceps enlarged and hood-shaped at apex. .*stylifera* Patch.

f^2. Forewings more than 2.5 mm. long, usually at least 3 mm.; body larger. (See *stylifera*.)

g^1. Wings broadly rounded at apex; antennæ about one and a half times width of head.

h^1. Male anal valve with a long posterior lobate prolongation with long hairs; forceps large, clavate at tip.............. *aylmeriæ* Patch.

h^2. Anal valve without long posterior lobe but posterior margin arcuately rounded caudad; forceps strongly arched laterally; vertex bulging in front; hind tibiæ usually with three apical spines inside.................................*albifrons* Crawford.

g^2. Wings angulate at apex, sometimes broadly so.

h^1. Female genital segment more than half as long as rest of abdomen; antennæ about one and one-third times width of head; wings rather narrowly acute at apex....................*alacris* Flor.

h^2. Female genital segment less than half as long as rest of abdomen; antennæ about one and a half times width of head; wings rather broadly acute at apex...........................*salicis* Mally.

d^2. Antennæ about two and a half times as long as width of head; body and wings small; pronotum rather long; apical spines on hind tibiæ very small...*viridis* Crawford.

c^2. Præscutum distinctly longer than broad; body large; gall-makers.

d^1. Antennæ twice as long as width of head; head nearly or fully as broad as thorax. Galls on leaves of *Magnolia;* nymph not pubescent. *magnoliæ* Ashmead.

d^2. Antennæ about one and a half times width of head; head usually much narrower than thorax. Galls on leaves of *Persea* (avocado or aguacate); nymph pubescent.................................*koebelei* Kirkaldy.

TRIOZA BAKERI Crawford.

Trioza bakeri CRAWFORD '10a:235.
Trioza montana CRAWFORD '11c:631.

Length of body 2.2 mm.; length of forewing 3.5. General color brown, light to dark; dorsum and abdomen sometimes darker; antennæ black at tip. Vertex and notum covered with fine short pubescence. Body large.

Head somewhat deflexed, almost as broad as thorax, large; vertex more than half as long as broad, pubescent, each lobe rounded broadly in front, with a foveal impression posteriorly on each side of median line; genal cones about two-thirds as long as vertex, divergent, acute to subacute, not much deflexed from plane of vertex. Antennæ scarcely longer than width of head, a little thicker relatively than in most species of the genus.

Thorax broad, arched, punctate, pubescent and slightly pulverulent. Pronotum long, not as conspicuously descending cephalad as usual. Hind tibiæ with three inner apical spines. Wings large, two and two-thirds times as long as broad, acute to subacute at apex; Rs very long, reaching nearly to apex of wing.

Genitalia.—Male.—Anal valve triangular in profile, with base broad and apex roundly acute, slightly longer than forceps; forceps thick, flattened, somewhat arcuate, apex not acute. *Female.*—Genital segment large, nearly as long as rest of abdomen; valves about equal in length, pubescent.

Described from one pair from Claremont, California (C. F. Baker); eight males and females from the mountains of the same locality (Crawford), collected in June on the foliage of *Pinus ponderosa,* white fir (*Abies* sp.), and a species of spruce (these latter were described as *T. montana* Crawford); seven specimens from Placer and Nevada Counties, California (Koebele), September. The latter specimens bear the manuscript name of *Trioza puberula* Riley.

Type in author's collection.

TRIOZA BREVIANTENNATA, new species.

Figs. 394, 396, 422.

Very similar in size and general proportions to *T. bakeri;* wings relatively a little shorter. General color light to dark brown, often very dark; legs and antennæ lighter, except latter black at tip; in light forms the vertex is dark brown to black. Vertex and dorsum not pubescent as in *bakeri*, but very coarsely punctate.

Similar in many respects to *bakeri*, but vertex very conspicuously bulging on each side of median line; genal cones relatively shorter; antennæ a little shorter, scarcely as long as width of head. Thorax as in *bakeri*, but not pubescent. Hind tibiæ with three apical spines within. Wings large, resembling *bakeri*.

Genitalia.—Male.—Anal valve as in *bakeri*, but base of triangle shorter; forceps similar, subacute at apex, sides almost parallel. *Female.*—Genital segment similar, but dorsal valve a little longer than ventral.

Described from two males and one female from Claremont, California (mountains), collected by C. F. Baker, no data with them.

Type in author's collection.

TRIOZA DIOSPYRI Ashmead.

Figs. 179, 356, 360, 519.

Psylla diospyri ASHMEAD **'81**: 222.
Trioza diospyri RILEY **'83**: 70.—CRAWFORD **'10b**: 352.—PATCH **'12b**: 226.
Trioza latipennis CRAWFORD **'10a**: 230.

Length of body 2.5 mm; length of forewing 4.4; width of head 0.79. General color shining black; middle and hind tibiæ and all tarsi whitish; pubescence long and sparse, conspicuous.

Head nearly as broad as thorax; vertex more than half as long as broad, emarginate in front at median line, with a broad shallow depression on each side discally; genal cones about half as long as vertex, subhorizontal, not strongly divergent, broadly rounded at apex, very densely hirsute. Antennæ about one and a third to one and a half times width of head, whitish except black at tip, clothed very sparsely with long hairs.

Thorax rather strongly arched, smooth and shining; pronotum short, much depressed below head and præscutum; latter narrowly rounded cephalad. Legs rather long, thickly pubescent; anterior metacoxal spur unusually long; hind tibiæ with three apical spines within. Wings much longer than body, very large, apex acute to subacute, about two and a half times as long as broad; Rs about as long as M to furcation point; second marginal cell unusually large. Hind wings relatively very small.

Genitalia.—*Male.*—Anal valve with a large, lobate, posterior prolongation; anus on a slender dorsal epiphysis; forceps long, somewhat cultrate in form, erect on basal two-thirds, apex flexed inward, not acute. *Female.*—Genital segment about half as long as rest of abdomen; dorsal valve a little longer than ventral, acute.

Described from more than 100 specimens of both sexes from the following localities: West Falls Church, Virginia (Nathan Banks); Clayton, Georgia (J. C. Bradley), May 18, 1911, altitude 2,000 feet; Burton, Georgia (Bradley), May 21, 1911, altitude 1,800 feet; Atlanta, Georgia (Bradley), June 30, 1909; Athens, Georgia (Bradley), June 15, 1909; Austell, Georgia, August 27, 1910; Savannah, Georgia (Schwarz), April 15, 1884; Thalmon, Georgia, April 28, 1911; Billys Island, Okefenoke Swamp, Georgia, June, 1912; Crescent City, Florida (Hubbard), May 23, on persimmons; Tampa, Florida (E. P. Van Duzee), May 2, 1908; San Antonio, Texas (E. A. Schwarz), May 9, 1907; Devils River, Texas (F. C. Bishopp), May 5, 1907; San Diego, Texas (Schwarz), April 29. No host plant data accompanies any of these specimens except the two taken on persimmons in Florida. This is said to be a very common species on persimmons, *Diospyros virginiana*, throughout the southern portion of the country. W. H. Ashmead's account of the life history of the species is given as follows (Ashmead '81:221–223):

> In the summer of 1879 I noticed for the first time that the leaves of the persimmon trees, *Diospyros virginiana*, in the vicinity of Jacksonville, Florida, were very much discolored, curled and distorted; on most of them, too, were numerous small, warty galls. A thorough examination under the curled and twisted parts of the leaves revealed numerous small, flattened hemipterous bugs, arranged in rows and covered with a fine mealy or powdery substance; on being disturbed they secrete large watery globules, the color of milky water. A careful study of these during the past two years has enabled me to completely work out their life history.
>
> By the middle of April they are found in considerable numbers on the young leaves * * *. At this time, also, they are caught copulating, soon after which the female begins depositing her eggs. These are very minute, 0.01 of an inch in length, elongate-ovate, pale greenish in color, with a wavy filament beneath at the thick end, nearly the length of the egg, extending backward over it. These are laid along the margin of the leaf without regard to regularity, the female first preparing for their reception by secreting a threadlike gummy, transparent substance along the extreme edge of the leaf; she then fastens them in place by the beak, which adheres securely to the gummy substance.
>
> The eggs hatch in from five to six days (actual observation) and the leaf from their punctures curls completely over them. Under this they reside until just before their transformation (last). The pupa then comes forth, attaches itself to a twig or leaf, and changes into the perfect fly, escaping through a longitudinal slit in the head

and thorax. The young take from four to five weeks to mature, and breed throughout the summer.

The fall brood probably lay their eggs in the crevices of the bark and twigs. These hatch at the first appearance of spring and feed on the tender new shoots and leaves, and are those found fully matured by the first or second week in April.

The larva is fringed on the margins with long hairs, as in other species of *Trioza*.

TRIOZA MEXICANA Crawford.

Figs. 210, 340, 389, 531.

Trioza mexicana CRAWFORD '11a:439.

Length of body (female) 2.6 mm; length of forewing 3.6; width of head 0.87. General color reddish brown, usually dark, occasionally lighter; head lighter than thorax; antennæ whitish on basal third, remainder black. Vertex and notum slightly pubescent.

Head not as broad as thorax; vertex more than half as long as broad, with a very shallow depression on each side of median line, rounded down in front toward genal cones; cones nearly or fully as long as vertex, rather slender, acute, not very divergent. Antennæ about one and a half times as long as width of head, slender.

Thorax strongly arched, punctate, pubescent slightly. Pronotum long. Hind tibiæ with three apical spines within. Wings dusky, membrane covered entirely with fine punctural dots; veins set with a double row of setæ; less than two and a half times as long as broad, broadly rounded at apex.

Genitalia.—*Male.*—Anal valve large, long, front margin straight, hind margin very arcuately rounded caudad, apex short; forceps long, sides subparallel except subapically, apex abruptly broadened, black. *Female.*—Genital segment almost as long as rest of abdomen; dorsal valve longer than ventral, both slender and acuminate in apical portion, margin slightly serrate.

Described from several males and females collected on a species of *Rhus* in the mountains near Cuernavaca, Mexico, altitude 10,000 feet (Crawford).

Type in author's collection.

TRIOZA MEXICANA MINUTA Crawford.

Body distinctly smaller than in the species. Head similar. Pronotum comparatively shorter. Wings smaller, less dusky; setæ on veins smaller and less prominent; venational characters similar. Genitalia similar, smaller in male.

Described from three females and one male from Oaxaca, Mexico (Crawford), no other data.

Type in author's collection.

TRIOZA PROXIMATA Crawford.

Figs. 388, 529.

Trioza proximata CRAWFORD '11a:435.

Length of body (female) 3.4 mm; (male) 2.4; length of forewing 3.7; width of head 0.78. General color light greenish yellow; ovipositor of female black; antennæ black apically.

Head small, much narrower than thorax; vertex a little more than half as long as broad, somewhat bulging in front on each side of median line, with a deep foveal impression posteriorly on each side; genal cones short, half as long as vertex, only slightly divergent, subacute, pubescent. Antennæ about twice as long as width of head.

Thorax large, broad, strongly arched, punctate; pronotum rather short, strongly descending cephalad; propleurites broad. Præscutum very narrowly rounded cephalad. Mesonotum long. Hind tibiæ with three apical spines within. Wings about two and a half times as long as broad, broadly rounded at apex; Rs very olong.

Genitalia.—*Male.*—Genital segment large. Anal valve about as long as forceps, triangular in outline, posterior margin angulately arcuate, anus on an epiphysis; forceps long, curved cephalad, and arcuate toward each other, rather slender, acutely pointed at apex, with two ridges of hairs on inner surface. Penis long. *Female.*—Genital segment very elongate and styliform except at base, nearly three-fourths as long as rest of body; base large, subglobose; apical two-thirds styliform, very slender and acuminate, dorsal valve longer than ventral. Pubescence short.

Described from several males and females from Oaxaca and Orizaba, Mexico (Crawford), August, 1910. No host plant data.

Type in author's collection.

TRIOZA COLLARIS Crawford.

Figs. 185, 187, 350, 509.

Trioza collaris CRAWFORD '10b:347; '11a:436.—PATCH '12b:225.

Length of body (female) 2.5 mm; length of forewing 3.7; width of head 0.72. General color greenish yellow; notum more or less streaked with brown; abdomen darker dorsad.

Very similar in most respects to *proximata*, differing as follows: Antennæ only about one and a half times as long as width of head; præscutum more broadly rounded cephalad; wings less broadly rounded at apex, sometimes subacute. Female genital segment not over half as long as rest of body, usually less than half; styliform prolongation not, or only a little, longer than basal portion. Male genitalia similar, but anal valve roundly arcuate behind, not angulately; forceps similar.

Described from several males and females from Claremont, California (Baker); Santa Clara County, California (Baker); Santa Cruz, California (Koebele), August 15, 1885; Los Angeles, California (Coquillett); Argus Mountains, California (Koebele).

Type in author's collection.

TRIOZA LONGISTYLUS Crawford.

Figs. 201, 338, 528.

Trioza longistylus Crawford '10a:233; '11a:434.—Patch '12b:227.

This is very similar to *collaris*, differing only in a few minor details. Genal cones bluntly rounded at apex, instead of acute as in *collaris;* clypeus larger; præscutum more broadly rounded cephalad. Female genital segment about midway in relative length between *collaris* and *proximata;* styliform prolongation relatively longer than in *collaris.*

Described from two females from Colorado (Baker), no data.

Type.—Cat. No. 18083, U. S. Nat Mus.

Miss Patch ('12b:227) assigns to this species several specimens from northern and central California, but these, I believe, belong to the species *collaris.* The two are distinguished with difficulty and it is possible that they are both one species. Until further evidence is available to prove this, however, I will not merge the two species into one.

TRIOZA QUADRIPUNCTATA Crawford.

Figs. 209, 336, 366, 527.

Trioza quadripunctata Crawford '10a:233; '11a:433.—Patch '12b:229.

Length of body about 2.2 mm; length of forewing 2.5 to 3.3; width of head 0.71. General color greenish yellow to dark brown, hibernating forms darker; antennæ white on basal two-fifths, the rest dark; tibiæ at tip and tarsi brown or black; forewings with four brown or black spots on hind margin.

Head much narrower than thorax; vertex very conspicuously bulging in front, little more than half as long as broad, with a foveal impression posteriorly on each side of median line accentuating anterior bulging; genal cones about two-thirds as long as vertex, acute, divergent, subvertical, only slightly pubescent. Antennæ about twice as long as width of head.

Thorax strongly arched, coarsely punctate; pronotum moderately long, much depressed below præscutum. Legs long; hind tibiæ with three apical spines within. Wings large, only a little more than twice as long as broad, costal margin more arcuate than usual, apex rounded but not broadly so; Rs usually short, straight; with a black spot at tip of clavus, one between branches of cubitus, one between cubitus and media, and a fourth between branches of media; spots sometimes not conspicuous.

Genitalia.—*Male.*—Anal valve about as long as forceps, posterior margin more or less angulately arcuate caudad; forceps long, slender, slightly curved forward, and arcuate toward each other, inner surface concave basally, subacute at apex. *Female.*—Genital segment almost as long as rest of abdomen, acute at apex, dorsal valve a little longer and less acute than ventral.

Described from many males and females from Colorado (type); Los Angeles, California (Coquillett); Bear Paw Mountains, Montana (Hubbard and Schwarz), September 17; Canastota, New York (Faure), hibernating on grass stems, March 12, 1913. Miss Patch has examined a number of specimens from several localities in Colorado: Boulder, Fort Collins (E. D. Ball), and Palmer Lake (Gillette).

Type.—Cat. No. 18084, U. S. Nat. Mus.

Because the species seems to be most common in the west the discovery of many hibernating forms in northern New York is especially interesting and deserving of some attention. The present data does not show whether the species has a wide distribution, or whether this portion of New York is merely an isolated point in its distribution.

The hibernating forms are very similar in all respects to the summer forms, except that the color of the body and wings is uniformly much darker.

TRIOZA ALBIFRONS Crawford.

Figs. 7, 188, 344, 361, 514.

Trioza albifrons CRAWFORD '10a:231; '10b:355; '11a:438.
Trioza rotundipennis CRAWFORD '10a:236; '11a:425.

Length of body 1.9 mm; length of forewing 2.4. General color brown to orange; head brownish, except margin of vertex light; pronotum whitish; præescutum and scutum with light stripes; genital segment of male whitish; antennæ white on basal third, remainder black.

Similar in many respects to *quadripunctata* and closely related to it, differing as follows: Body smaller; thorax narrower, not much broader than head; vertex bulging less conspicuously in front. Legs more slender and relatively longer; apical spines of hind tibiæ small, sometimes only two on inside instead of three. Wings usually more broadly rounded at apex, without marginal spots which are present in the related species; venation similar in most respects, but Rs relatively longer. Male genitalia similar; anal valve less angulate on posterior margin (profile); forceps shorter. Female genitalia similar.

Described from numerous specimens of both sexes from Stanford University, California (Crawford), February and March, 1912, on *Urtica holoserecia;* Nordhoff, California (Crawford), March, 1911, on same host; Claremont, California (Baker); Bear Paw Mountains, Montana (Hubbard and Schwarz), September 17.

Type in author's collection.

Trioza rotundipennis is merely a variant of this abundant species and not specifically distinct. Although the description of this species appeared before that of *albifrons*, the latter preceded it in the preliminary synopsis and therefore has priority in the name.

Both this species and *quadripunctata* are exceedingly closely related to the European species *urticæ*, likewise abundant on nettles. Indeed, it was only after very close comparison that *albifrons* was not merged into *urticæ*. The principal difference lies in the male forceps; in *urticæ* they are constricted midway, broadened distally and terminate in a conspicuous hook-like process, while in *albifrons* they are not constricted midway nor broadened distally and terminate in a black, subacute tip; they are distinctly shorter and stouter also in *albifrons*.

T. quadripunctata is usually easily distinguished from *albifrons* by the wing markings, but sometimes these maculæ are less prominent. It is possible that careful life-history studies will show these two American species to be variants of one species. They are apparently often found closely associated in their habitats.

Nymph.—From 1 to 2 mm in length, according to age, ovate in shape, flat; color: Pale greenish yellow in youngest forms, brown to dark brown in older nymphs; latter with a median dorsal white stripe over entire length, with a fringe of spine-like processes from entire margin and a double row of eight spines on dorsal white stripe. Present in large numbers, singly, on both surfaces of the leaves of *Urtica holoserecia* without flocculence; move about readily and freely. Eggs, nymphs and adults found together in February to April at Stanford University and Nordhoff, California. Adults probably winter over and lay eggs in the early spring. There seem to be several continuous generations.

The *eggs* are deposited on the under side of the leaves in great numbers; they are whitish, pyriform in shape, with the large end attached to the leaf, and the other end terminating in an acute point; they stand erect or nearly so.

TRIOZA FRONTALIS Crawford.

Figs. 184, 342, 355, 358. 359, 362, 513, 518.

Trioza frontalis CRAWFORD '10a: 230; '10b: 353; '11a: 426.
Trioza similis CRAWFORD '10b: 352.
Trioza similis fovealis CRAWFORD '11a: 438.

Length of body 2 mm.; length of forewing 2.9 to 3.2; width of head 0.65. General color brownish red, abdomen brownish; genal cones and antennæ usually black, at least apically.

Head narrower than thorax, deflexed; vertex a little more than half as long as broad, somewhat bulging in front, with a foveal impression (often deep) on each side of median line; genal cones acute, divergent, two-thirds or fully as long as vertex, slightly pubescent. Antennæ about one and a half times as long as width of head, segment III thicker than succeeding segments.

Thorax strongly arched, punctate. Hind tibiæ with three apical spines on inner side. Wings about two and a half to two and two-thirds times as long as broad, narrowly rounded to subacute at apex; Rs usually rather short.

Genitalia.—*Male.*—Genital segment very large; anal valve very large, produced caudad into a large, broad flap on each side; much broader at apex than at base; apical margin concave, with a fringe of long hairs; with a ridged rib extending into posterior lobe as well as axis. Forceps large, clavate, arcuate inward, apex coarsely toothed or serrated. *Female.*—Genital segment almost as long as rest of abdomen, acute, dorsal valve longer than ventral, apex slender.

Described from several specimens from Colorado (no data); sixteen males and females from Placer County, California (Koebele), on *Amelanchier alnifolia* Nuttall, September 24–30, 1885. These latter are very similar to *obtusa* Patch, a species found on another species of *Amelanchier* in Maine.

Type.—Cat. No. 18085, U. S. Nat. Mus.

TRIOZA FRONTALIS SULCATA Crawford.

Trioza sulcata CRAWFORD '10a: 233.
Trioza frontalis sulcata CRAWFORD '11a: 436.

The differences between the varietal form and the species are slight. Coloration depends on the age of the individual largely, and perhaps this may account for the difference between them. Color dark reddish brown. Præscutum distinctly less arched than in species; notum finely and inconspicuously pubescent.

Described from several specimens from Colorado (no data).

TRIOZA OBTUSA Patch.

Trioza obtusa PATCH '11: 18.

Length of body 2.1 mm.; length of forewing 2.6 to 3.1; width of head 0.77. General color reddish brown; newly emerged individuals pale green, older ones light reddish to dark, wings often dark and smoky; vertex often covered with a white powdery substance.

Very similar and closely related to *frontalis*, differing as follows: Body usually larger, head and thorax relatively distinctly broader, especially the head; vertex finely pubescent, a little more bulging in front; genal cones thicker at base, relatively shorter. Antennæ only about one and a fourth times as long as width of head, segment III sometimes thickened, often not. Thorax strongly arched, sometimes very finely pubescent. Wings large, often smoky; Rs very long, reaching nearly to apex of wing.

Male genitalia similar, except posterior lobe of anal valve is narrower; forceps similar in shape, but apex not toothed, with one indentation anteriorly. Female genitalia similar.

Described from one paratype specimen (female) from Orono, Maine (Patch), collected on *Amelanchier canadensis* (Linnæus) Medicus, in July; several from Washington, D. C. (Koebele), April 6–27, 1885; and Maryland (Koebele), February 22, 1884; these bear the manuscript name of *Trioza amelanchieris* Riley, indicating probably that they were taken on *Amelanchier*, although there is no data to indicate this fact.

This species is remarkably closely related to *T. frontalis*, but seems to be quite distinct, nevertheless. Miss Patch (**'11**: 19–20) has recorded some interesting and valuable life-history data for this species, which is well worth quoting here.

> The nymphs of this species were found in all stages upon the leaves of *Amelanchier canadensis*. They were collected by Mr. William C. Woods, July 6–27, 1910. They fed upon the ventral surface of the leaves where their presence was readily detected on account of the beautiful white, floss-like wax filaments that curled softly up from the margin of their bodies. These wax filaments are secreted by wax glands which extend in a single marginal row in the earlier stages, but which in the later stages occur both on the margin and for a considerable distance mesad on the dorsal surface of the body. A crescent-shaped area of wax glands surrounds the anus in all the nymphal stages.

TRIOZA LOBATA, new species.

Figs. 140, 143, 401.

Length of body 2 to 2.7 mm.; length of forewing 3.1; width of head 0.76. General color light yellowish brown; abdomen greenish ventrad; sternum partially, genital segment in both sexes, antennal segments IX–X and tips of IV–VIII black; forewings extensively maculated with brown and numerous round darker spots scattered over the maculæ.

Head a little narrower than thorax; vertex large, not quite twice as broad as long, pubescent conspicuously, with a shallow depression on each side of median line, emarginate in front; genal cones scarcely two-thirds as long as vertex, separated somewhat at base and divergent, rounded at apex, pubescent. Antennæ a little less than twice as long as width of head, conspicuously ringed.

Thorax rather strongly arched, covered sparsely with rather long hairs. Pronotum short, strongly descending cephalad. Mesothorax large. Legs short and thick; hind tibiæ with two thick black spines at apex on inner side and one on outer side. Wings large, less than two and a half times as long as broad, broadly angulate at apex, veins heavy; maculated conspicuously (fig. 401); marginal cells large, subequal; Rs long.

Genitalia.—*Male.*—Anal valve with a long caudal lobe on each side, longer than axis of valve and converging to a narrow tip, reaching a little beyond forceps. Forceps long, slender, narrowed midway, abruptly broadened distad into a T-shaped end; from behind, arched strongly laterally and appearing acute at end, broad at base. *Female.*—Genital segment not longer than preceding ventral sclerite, small, acute, dorsal valve slightly longer than ventral, pubescent.

Described from twelve males and females from Los Angeles, California (Koebele), taken on "a species of *Ceanothus*"; one female from Arizona (Morrison), 1882 (no data).

Type.—Cat. No. 18086, U. S. Nat. Mus.

This is a very easily distinguished species because of its conspicuously marked wings. The name *lobata* is Riley's manuscript name for this species.

TRIOZA TRIPUNCTATA Fitch—not Loew.

Figs. 198, 334, 368, 524.

Psylla tripunctata FITCH '51:64.—RILEY '80:62.—LINTNER '93:64.
Trioza tripunctata RILEY '84:70.—MALLY '94:154 (*Phylloplecta id.*?).—SMITH '09:110.—CRAWFORD '10a:231, 232; '11a:430.—PATCH '12:230.
Psylla rubi WALSH and RILEY '69:225.—THOMAS '79:17.—FULLER '80:62.—RILEY '80:62 (footnote).

Length of body (female) 2.6 mm; (male) 2.1; length of forewing 3 to 3.5; width of head 0.79. General color brown to dark brown, dorsum often black; head lighter; antennæ yellowish, black at tip; legs light brown.

Head much narrower than thorax; vertex rather flat, with a slight depression discally on each side of median line, more than half as long as broad, front margin a semicircle; genal cones about two-thirds as long as vertex, thick at base, subacute, usually not deflexed much from plane of vertex, pubescent. Antennæ about one and a half times width of head, slender.

Thorax broad, arched strongly. Pronotum short. Legs rather long and thick; hind tibiæ with two large spines on inner side, one outside. Wings large, about two and a half times as long as broad, subacute at apex, with three brown bands, one on Cu and extending into basal subcostal cell, another on M, and the third on distal half of Rs; marginal cells small; Rs long.

Genitalia.—*Male.*—Genital segment rather large; anal valve produced caudad into a long distally rounded lobe (in lateral view); forceps long, curved forward, tapering to an acute point at apex, with three sharp edges. *Female.*—Genital segment acute at apex, from one-half to three-fourths as long as rest of abdomen, dorsal valve a little longer than ventral.

Described from several males and females from: Washington, District of Columbia (Koebele), February to May, 1884; Virginia (no data); Holderness, New Hampshire (Koebele); Jamaica, Long Island (Sirrine), October 11. Reported (Patch '12b:230) at Orono and Sebago Lake, Maine, on blackberry bushes, August, 1904 and 1911; said to be abundant on this host plant. Reported also from several localities in New York State.

The *nymphs* and pupæ are yellowish and pellucid, the head and thorax being a deeper yellow than the rest of the body; eyes are dark red; meso- and metathorax sometimes pale green. They are surrounded by flocculent, white fluff on the ventral surface of the blackberry leaves (Patch '12b:230). Both nymphs and imagines found in August.

TRIOZA ARIZONÆ Aulmann.

Figs. 189, 357, 363, 515.

Trioza marginata Crawford '10a:232; '10b:356.—Patch '12b:228.
Trioza arizonæ Aulmann '13:39 (new name).

Length of body 2 mm; length of forewing about 3; width of head 0.70. General color light brown, mesoscutellum often with two darker stripes; antennæ and legs lighter colored; abdomen pale ventrad.

Head narrower than thorax, much broader than prothorax; vertex slightly impressed discally and postocellar areas well elevated, about twice as broad as long, scarcely emarginate in front at median line. Genal cones about two-thirds as long as vertex, slightly divergent, subacute, sparsely pubescent. Antennæ about one and a half times as long as width of head.

Thorax strongly arched, moderately broad; pronotum very short, much longer than præscutum. Hind tibiæ with two small spines at apex within and one outside. Wings slender, nearly three times as long as broad, subacute at apex, with a more or less pronounced brown band along posterior margin.

Genitalia.—*Male.*—Anal valve with a relatively large lobate projection caudad on each side, somewhat as in *maura;* forceps slender, simple, acute, and slightly toothed on inner margin apically. *Female.*—Genital segment short, scarcely longer than preceding segment, very acutely pointed; dorsal valve slightly longer than ventral.

Described from one male and several females from Arizona (no data), and one from Fort Yuma, Arizona (Hubbard), January 20.

Type.—Cat. No. 18087, U. S. Nat. Mus. (Type of *T. marginata.*)

This species shows a marked resemblance to *T. maura,* but is sharply differentiated from it by the maculation of the wings.

TRIOZA MAURA Förster.

Figs. 190, 192, 354, 365, 370, 371, 372, 517, 520, 522.

Trioza maura Foerster '48:94.—Meyer-Dür '71:387.—Loew '82:242; '84:144 (nymph); '88:24.—Oshanin '07:376.—Sulc '11:10 (bibliography and good figures).—Patch '12b:228.
Trioza helvetina Meyer-Dür '71:388, 391.
Trioza nigrifrons Crawford '10a:230; '10b:351.
Trioza fulvida Crawford '10a:231; '10b:358.
Trioza fulvida similis Crawford '10b:359.
Trioza aurantiaca Crawford '10a:231; 10b:360; '11c:628.

Length of body 1.8 to 2.3 mm; length of forewing 2.8 to 3.5; width of head 0.65 to 0.73. General color variable from light orange yellow to dark reddish brown or dark red; vertex and cones usually reddish, sometimes pale on margin, occasionally dark brown or even black; antennæ white usually on basal third or half, the rest orange to black; abdomen pale ventrad, though sometimes not; legs orange, tarsi often black. The autumn forms are usually darker than the spring forms.

Head narrower than thorax; vertex rather flat, a little more than half as long as broad, with front margin broadly and evenly rounded and raised slightly, with a shallow or deeper foveal impression discally on each side of median line. Genal cones two-thirds to three-fourths as long as vertex, divergent, acute, slightly pubescent, more or less deflexed from plane of vertex. Antennæ about one and a half times as long as width of head, nearly always whitish at base.

Thorax strongly arched, punctate; pronotum short; legs slender to rather stout; hind tibiæ with two black spines at apex on inner side and one without. Wings variable in length, usually about two and a half times as long as broad, subacute to narrowly rounded at apex, usually clear, but sometimes more or less fulvous or smoky, anal angle black; Rs usually long, rarely shorter and straight.

Genitalia.—*Male.*—Anal valve short, with an ovate, lobate prolongation caudad reaching about to base of forceps, longer than broad; anus on a slightly elevated ring above caudal prolongation. Forceps long, curved forward, very acute, and acuminate, sharply edged. *Female.*—Genital segment very short, scarcely longer than preceding segment, acute at apex, dorsal valve slightly longer than ventral.

Described from numerous males and females from the following localities: *California:* Laguna Beach (Crawford), August, 1911, on *Salix lasiolepis;* Los Angeles (Coquillett); Placer County (Koebele), September, on *Salix lasiolepis;* Nevada County (Koebele), September; Folsom (Koebele), August 18, 1885, on *Salix longifolia* (these bear the manuscript name of *Trioza saliciperda* Riley); San Mateo

(Koebele), September, on *Salix lasiolepis;* Ormsby County, Nevada (C. F. Baker); Colorado (no data), on *Salix;* Santa Fe, New Mexico (H. S. Barber); American Forks, Utah (Hubbard and Schwarz); Oregon (Koebele); Easton, Washington (Koebele); Algonquin, Illinois, July 12, 1895.

Nymphs, also, have been taken on *Salix lasiolepis*, showing that the willows are undoubtedly the food plant of the species.

This is a very abundant species and subject to some variation, as the above synonymical list shows. After careful examination of numerous specimens from many localities and comparison with Sulc's excellent figures (**'11:** pl. 14), it is apparent that all these variants (formerly described as species) belong to one and the same species, and, furthermore, that this species is identical with the European species *maura* Forster. The distribution seems to be exceedingly wide. The food plants, both here and in Europe are species of *Salix*, the willows.

According to the description by Sulc (I have seen no European specimens) there are some slight differences between the European and American forms. The head, in the latter, is typically orange with some black, while Sulc described it in the European forms as typically mostly black. The abdomen, too, in the American forms is typically white or pale ventrad, while Sulc describes the abdomen as entirely brown. In the American forms, however, these characters are not constant, and therefore, these differences in description between the American and European forms are not surprising.

The following is taken from Loew (**'84:**144–145): *Nymph* flat, 2.5 mm long and 2 mm broad, egg-shaped, glabrous, green, yellow, or yellow with greenish spots; with a dark brown dorsal stripe and several cross bands; eyes red; with a fringe of hyaline hair-like projections around entire margin, about as long as width of brown bands.

Found singly on the under surface of leaves of *Salix alba* and *S. purpurea;* Adults emerge about the first of October and over-winter. In the following May and June the females oviposit. Parasitized nymphs are black and always on the upper surface of the leaves.

It is quite probable that the American forms pass through a similar life history, since adults may be collected in late autumn.

The following two species, *T. salicis* and *T. varians*, are very closely related to this species and often very difficult to distinguish from it. The male genitalia are very similar in the three species, differing only in slight details; the female genital segment, however, shows some specific differences. It is possible that these three should be considered as one polymorphic species, but since they can be distinguished it is just as well to regard them as specifically distinct. *T. marginata* is, also, closely related to this group of three species.

TRIOZA SALICIS Mally.

Figs. 191, 195, 196, 202, 335, 337, 341, 364, 387, 516, 525, 526, 530.

Trioza salicis MALLY '94:161.—CRAWFORD '11a:432.
Trioza assimilis CRAWFORD '10a:233; '11a:438; '11b:503 (name changed to *flori*).
Trioza flori CRAWFORD '11b:503 (footnote).
Trioza pomonæ AULMANN '13:51.
Trioza dubia PATCH '12b:226.
Trioza nigra CRAWFORD '10b:358; '11b:503 (changed to *nigrilla*).
Trioza louisianæ AULMANN '13:48.
Trioza minuta CRAWFORD and var. *similis* CRAWFORD '11a:432, 433.

Very similar to *maura* in size and proportions; color similar, except vertex and cones typically dark to black, occasionally light; abdomen not white ventrad. Most of the structural difference are slight and difficult to describe. Vertex lobately swollen in front on each side of median line, more coarsely punctate. Wings similar, subacute to narrowly rounded at apex, seldom flavous, usually clear, anal angle seldom dark.

Genitalia.—*Male.*—Anal valve similar, but caudal prolongations shorter, sometimes shorter than broad; forceps often shorter. *Female.*—Genital segment twice as long as in *maura*, slender, acute, dorsal valve longer than ventral.

Described from many specimens of both sexes from the following localities: Ames, Iowa (Mally), September to December, 1894, on *Salix* sp.; Stanford University, California (Crawford), September, on *Salix lasiolepis;* Santa Clara County, California (Baker); Leona Heights, Alameda County, California (J. C. Bradley), August; Placer County, California (Koebele), October (these are labeled *Trioza pyrifoliæ*[1] (?) Forbes: Ormsby County, Nevada (Baker); Colorado; Easton, Washington (Koebele); District of Columbia, August 24, 1899.

I have examined three paratypes (one male and two females) of *T. dubia* Patch, and find this species to be identical with *salicis*. These specimens are from San Francisco, California (Bradley) The similarity between *flori* and *salicis* was noticed in the preparation of the previous papers, but no males of *salicis* were then available and therefore the identity of the species could not be established. The Iowa forms have relatively shorter genal cones than the western forms and less divergent, but I believe this is only a minor variation.

TRIOZA VARIANS Crawford.

Figs. 194, 369, 523.

Trioza varians CRAWFORD '10ac:231; '10bc:361; '11c:628.

Similar in size and general proportions to *maura*. Color characters conspicuous: general color brown to black; vertex dark with a broad yellow border; cones dark; pronotum orange; præscutum orange on

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[1] I have been unable to obtain authentic specimens of this species, and have not included it in the synoptic table of species.

hind margin and a longitudinal dorsal stripe; scutum with several orange stripes; femora black, tibiæ orange; antennæ as in *maura;* female genital segment usually dark with an orange spot dorsad. These colors may be much less pronounced in some forms, though this is typical.

Vertex and head rather similar to *maura.* Wings smoky, seldom fulvous, usually broadly rounded at apex. Male anal valve similar, but smaller, as in *salicis,* distinctly more pubescent; forceps more pubescent. *Female.*—Genital segment very short, as in *maura,* dorsal valve blunt at apex.

Described from many specimens from Alta, Utah (Hubbard and Schwarz), June 30, on *Salix* sp.; Banff Springs, Alberta, Canada (Hubbard and Schwarz), June 10; Placer and Nevada Counties, California (Koebele), September; Colorado (Gillette).

Type.—Cat. No. 18088, U. S. Nat. Mus.

The most typically colored specimens are from Alta, Utah.

TRIOZA LONGICORNIS Crawford.

Figs. 193, 367, 521.

Trioza longicornis Crawford '10b: 359.

This is apparently very close to *varians* and perhaps identical. The type, and only, specimen on which the description was based is not before me, and therefore I am unwilling to refer it to *varians.* It has not been included in the synoptic tables because certain of its characters are not known to me. The following description is adapted from the original one.

Length of body 2.4 mm; length of forewing 3.6; width of head 0.72. General color greenish yellow, notum slightly darker.

Vertex sharply defined on front margin, with two broad depressions diverging toward front margin from the usual foveæ near posterior margin; emarginate in front at median line; genal cones long, fully as long as vertex, divergent, acute at apex, pubescent. Wings transparent, about two and a half times as long as broad, broadly rounded at apex; Rs long; veins yellowish.

Genitalia—Female.—Genital segment short, about as long as preceding ventral sclerite, dorsal valve longer than ventral.

Described from one female from Vancouver, British Columbia.

Type.—Cat. No. 18089, U. S. Nat. Mus.

TRIOZA NICARAGUENSIS Crawford.

Figs. 212, 339. 534.

Trioza nicaraguensis Crawford '11a: 436.

Length of body 1.7 mm; length of forewing 3.1; width of head 0.55. General color lemon yellow; antennæ black at tip. Insect small.

Head not as broad as thorax, finely punctate; vertex not deeply sulcate, with a small fovea on each side, bulging forward on each side of the median line in front; genal cones short, scarcely two-thirds as long as vertex, acute, divergent, very slightly pubescent. Antennæ slightly over one and one-fourth times width of head, slender.

Thorax arched rather strongly; pronotum short. Legs slender; hind tibiæ with two very small spines at apex inside and one outside. Wings small, transparent, about three times as long as broad, subacute at apex.

Genitalia.—*Female.*—Genital segment large at base, subglobose, each valve produced at end into a short, slender, acutely pointed process.

Described from one female from San Marcos, Nicaragua (C. F. Baker).

Type in author's collection.

The genitalia are very easily recognizable in this species.

TRIOZA STYLIFERA Patch.

Figs. 139, 414.

Trioza stylifera PATCH '12b:229.

Width of head 0.61 mm; length of forewing 2.4 to 2.6. General color brownish; antennæ pale brown, dark at tip.

The only specimen before me of this species is a balsam mount containing the head, both wings, and the male cauda of one specimen, consequently not all the usual characters can be given.

Vertex more than half as long as broad, somewhat emarginate in front at median line; genal cones scarcely two-thirds as long as vertex, rather strongly divergent, acute at apex, slightly pubescent. Antennæ about one and a half times as long as width of head. Because of its resemblance to certain other species I have inferred that the hind tibiæ have two spines at apex on inner side (an uncertain inference), and have placed it in that category in the synoptic tables. Wings yellowish, broadly rounded at apex, with a slight degree of angulation at tip of medial vein; Rs short and straight; venation suggesting *albifrons* somewhat.

Genitalia.—*Male.*—Anal valve moderately large, produced caudad a little (in lateral aspect); forceps nearly as long as anal valve, narrowed midway, then broadened and thinner at apex and forming a hood. *Female.*—Genital segment "relatively long and acutely pointed; the upper plate extends a bit beyond the ovipositor and is slender at tip" (Patch).

Described from one male (paratype?) mounted in balsam (with thorax and legs wanting), kindly loaned to me by Miss Patch; collected at Brockville, Ontario (W. Metcalfe), October, 1903.

TRIOZA AYLMERIÆ Patch.

Trioza aylmeriæ PATCH '12b:225.

Two balsam mounts of this species containing two heads, four wings and a male and female cauda have been loaned to me by Miss Patch. As in the case of *T. stylifera*, the inference that the hind tibiæ possess two apical spines on the inner side is based on its resemblance to certain species with this character.

Head about 0.82 mm broad, more than half as long as broad; genal cones scarcely two-thirds as long as vertex, acute to subacute, divergent, pubescent. Antennæ about one and a half times as long as width of head, rather thick. Wings rather slender, about 3.2 mm long, broadly angulate at apex, with a tinge of flavous; veins yellow; venation typical.

Genitalia.—Male.—Anal valve large, with a pair of very long, lobate processes extending caudad and somewhat upward, from basal two-thirds of valve; with many very long hairs at end of processes; forceps rather long, constricted subapically, apex enlarged. *Female.*—Genital segment longer than preceding ventral sclerite, but not as long as the two preceding, acute at apex, dorsal valve a little longer than ventral.

Described from portions of one male and one female (paratypes?), mounted in balsam; locality: Aylmer, Ottawa, Ontario, Canada (W. Metcalfe), on "Bilberry," May 20, 1906.

TRIOZA ALACRIS Flor.

Figs. 137, 421.

Trioza alacris Flor '61:380, 386, 393, 398.—Loew '82:230; '86:160; '88:22.—Oshanin '07:372.—Dickel '05:402.—Thomas '91:92.—Crawford '12a:86.—Sulc '12:49.

Trioza lauri Targioni-Tozetti, Resocont. Soc. Ent. Ital., 1879:19.

Length of body 1.9 mm; length of forewing 3.2; width of head 0.71. General color greenish yellow to light brown; dorsum in darker individuals more or less striped and streaked with brown; abdomen often brown; antennæ black at tip.

Head nearly as broad as thorax, not strongly deflexed; vertex more than half as long as broad, emarginate in front at median line, with a prominent sulcate impression on each side of median line and parallel to it; genal cones scarcely two-thirds as long as vertex, divergent, subacute, pubescent, not much depressed from plane of vertex. Antennæ about one and a third times width of head, slender.

Thorax not broad, well arched, punctate; pronotum moderately long, not strongly depressed; præscutum rather large. Legs slender; hind tibiæ with two black spines at apex on inside and one outside. Wings long, slender, transparent, fully three times as long as broad, subacute at apex; Rs short.

Genitalia.—Male.—Anal valve a little longer than forceps, hind margin arcuate, with long pubescence; forceps rather stout, sides almost parallel (from side), terminating in a subacute, black point at apex. *Female.*—Genital segment nearly as long as rest of abdomen, Described from three males and two females from Virginia, October 9, 1881, on *Sonchus arvensis;* one male and three females from Washington, District of Columbia (E. A. Schwarz), June; many males, females, and nymphs from Atlanta, Georgia (J. C. Bradley), July 6, 1909.

Type.—Cat. No. 18094, U. S. Nat. Mus.

The nymph of this species is distinctly *triozine* in form, being bordered completely by a dense fringe of long, white, hair-like processes, so characteristic of *Trioza* species.

Subfamily PSYLLINÆ.

Head more or less deflexed, sometimes perpendicularly so; vertex quadrate, semicircular, or subtriangulate; genæ produced into variously shaped lobes or cones beyond end of vertex; frons covered by genæ, visible only as a very small sclerite bearing front ocellus. Antennæ typically ten-segmented, long or short. Thorax usually well arched; sclerites of thorax variable, as described under tribes and genera. Hind tibiæ often with a spur at base, with five to twelve black spines at apex; basal tarsal segment of hind legs with a pair of black claw-like spines at apex. Wings variable from thick to hyaline, rhomboidal to elongate-ovate, seldom, if ever, ovate *and* at the same time acutely angled at apex, as in *Trioza;* media and cubitus always with a petiole.

There are grouped in this subfamily several genera not heretofore associated together. Several genera formerly placed in Aphalarinæ have been transferred to this group because of obviously close relationships one to another. The relative length of the cubital petiole (M+Cu) and the discoidal subcosta (R) has been the basis for separating certain of these genera into one or the other of Aphalarinæ or Psyllinæ, but this character is of little value and often separates widely two closely related species, or even two specimens of the same species.

A comparison of forms at opposite ends of the subfamily series does not show any apparently close similarities, and yet with the many intermediate forms before us, we readily see the inter-relationships and similarities of the various genera. The group has been, for convenience, divided into four tribes: Pachypsyllini, Euphyllurini, Arytainini, and Psyllini.

The principal and most distinctive characters of this subfamily are the concealed frons, the presence of genal cones or lobate processes, the presence of the apical claw-like spines on the posterior basal tarsus (not limited, however, to this group), and the presence of a cubital petiole (M+Cu). The following synoptic table shows the relationships of the tribes and genera to each other to a certain extent.

parallel, apex square, with sharp, black edge. *Female.*—Genital segment almost as long as rest of abdomen, large and thick, rounded caudad, and each valve produced into a short, slender, acute process, the dorsal one distinctly longer than ventral.

Described from one male and two females from Claremont, California (C. F. Baker), and one female from Los Angeles, California (Coquillett).

Type in author's collection.

TRIOZA MAGNOLIÆ Ashmead.

Figs. 199, 343, 390, 533.

Psylla magnoliæ Ashmead '81: 224.
Trioza magnoliæ Riley '83: 70.—Crawford '10a: 228.
Allotrioza magnoliæ Crawford '11a: 445.

Length of body (female) 2.9 mm.; (male) 2.1; length of forewing (female) 3.8 to 4; (male) 2 mm.; width of head 0.94. General color greenish yellow; tips of antennæ, tarsi, beak, black or brown. Body large.

Head large, nearly or fully as broad as thorax; vertex about twice as broad as long, with a deep foveal or sulcate depression on each side of median line, coarsely punctate. Genal cones two-thirds to three-fourths as long as vertex, thick, divergent, subacute. Antennæ long and slender, twice as long as width of head or more.

Thorax large, broad, not strongly arched, coarsely punctate; pronotum moderately long, depressed below head and præscutum; præscutum distinctly longer than broad. Legs long; hind tibiæ with two large spines at apex within, and one on outer side. Forewings large, about three times as long as broad, subacute at apex, transparent; venation resembling that of *Paratrioza arbolensis* somewhat.

Genitalia.—*Male.*—Abdomen constricted just before genital segment; latter rather large; anal valve slightly longer than forceps, caudal margin strongly arcuate, front margin nearly straight, narrow at apex, pubescent. Forceps moderately broad, front margin bowed forward, with a black, sharp apex, which is in line with the posterior edge; caudal margin pubescent. *Female.*—Genital segment nearly as long as rest of abdomen, valve subequal in length, acutely pointed, pubescent.

Described from many males and females from Crescent City, Florida (H. G. Hubbard); Biscayne Bay, Florida (Schwarz), May 10; Savannah, Georgia (Schwarz), April 15, 1884; Billys Island and Honey Island, Okefenoke Swamp, Georgia, June, 1912 (J. C. Bradley, and others).

This species according to Ashmead ('81: 224) is a true gall-maker on leaves of *Magnolia glauca*, the common bay magnolia of the southern swamps. Ashmead describes the galls as being "quite conspicuous on the leaves, of a large size, greenish in color with a bluish plume, and when fully mature open along the side in the form of a large, curved lip." They are half an inch or more in length.

Ashmead was unable to find the eggs on the leaves and concluded that they were deposited beneath the surface within the tissue.

Nymphs are abundant in the galls in various stages of growth and surrounded by a milky fluid which usually almost fills the galls. They are elongate-ovate, over 2 mm. long when mature, flattened, pale yellow to green, without marginal hairs, not pubescent. He does not state the times of emergence of the adults, but from the data accompanying the specimens at hand, it appears to be April to June.

TRIOZA KOEBELEI Kirkaldy.

Trioza koebelei Kirkaldy '06 :290.

Very similar to *T. magnoliæ* in size and general appearance, differing as follows: Color darker, light brown to dark blackish brown; "head and thorax varying from dark fulvous to blackish, polished, shining; antennæ testaceous except apically; femora dark fulvous or blackish brown, tarsi and tibiæ testaceous except apices of apical tarsal segments; abdomen smooth, polished, and shining, with a dark bluish-green gloss." Head broader than anterior portion of thorax but distinctly narrower than broadest part; genal cones relatively shorter and more horizontal than in related species (*magnoliæ*); antennæ distinctly less than twice as long as width of head. Thorax similar; wings similar, but marginal cells subequal or the second larger. Genitalia of female similar.

According to Kirkaldy's poor illustration, the male genitalia are quite different.

Described from two females from Cuernavaca, Morelos, Mexico, collected by A. L. Herrera, on *Persea gratissima* (alligator pear, or aguacate, or avocado), February, 1906. The specimens are much lighter in color than those described by Kirkaldy, but they seem surely to be his species. He describes the head and eyes as being broader than the thorax, but he undoubtedly meant the anterior portion of the thorax and not its broadest part.

The gall is described as being large, light brown, ovoid with a truncate base, and placed erect usually on the upper surface of the leaves. Height about 6 mm. The insect is said to be very destructive.

One late nymph, in the collection before me, is darker in color than that of *magnoliæ*, and is covered with long sparse pubescent on the dorsal surface.

Genus CECIDOTRIOZA Kieffer.

This genus is unknown to me in nature and has not been included in the synoptic table of the genera. As near as can be determined from Kieffer's descriptions, its members come near to *Trioza magno-*

lisæ and *koebelei.* The genus is probably not distinct from *Trioza,* but no disposal of it will be made until specimens of its species are available for comparison.

Two species have been described in the genus, one from Argentina, South America, and the other from Asia. Both are gall-forming (as are also the two *Trioza* species mentioned above), the Argentine form being on *Baccharis.*

CECIDOTRIOZA MENDOCINA Kieffer.

Cecidotrioza mendocina KIEFFER '10 : 372.

Locality.—Province of Mendoza, in Pedragal and Chacras de Coria, Argentine Republic; December to last of June.

Galls on *Baccharis salicifolia.* The flower head is greenish, becoming enlarged, thick, three to four times normal size, 8 to 9 mm. long, and almost as thick; the bractlets are enlarged and produced, linear and curled at the tip (Kieffer '**10**: 372).

Genus NEOTRIOZELLA Crawford.

Head as broad as or broader than thorax, latter narrow; genal cones long, usually slender, not at all divergent, but closely appressed from base to tip, acute at apex, usually vertical; vertex more or less plane; antennæ more than twice as long as width of head. Pronotum short, descending strongly cephalad, much depressed below level of head and præscutum. Forewings elongate; hind tibiæ with three spines at apex within.

Type of genus.—*Neotriozella immaculata* Crawford.

The members of this genus are very peculiar, and easily distinguished from other species by the remarkable form of the genal cones. The original name *Neotrioza* was found to be preoccupied by *Neotrioza machili* Kieffer (1905), and was consequently changed to *Neotriozella* (Crawford '**11b**: 503, note).

SYNOPSIS OF SPECIES.

a^1. Genal cones longer than vertex; forewings two and a half to three times as long as broad.
  b^1. Genal cones slender, acute at apex, whitish; vertex reddish with light margins; antennæ rather slender................................*immaculata* Crawford.
  b^2. Genal cones moderately thick, less acute at apex, strigate, dark brown; vertex brown; antennæ moderately thick...............*sculptoconus*, new species.
a^2. Genal cones not longer than vertex; forewings three times as long as broad; vertex and genal cones black ....*laticeps* Crawford.

NEOTRIOZELLA IMMACULATA Crawford.

Figs. 205, 213, 216, 332, 539.

Trioza immaculata CRAWFORD '10a: 233.
Neotrioza immaculata CRAWFORD '11a: 450.
Neotriozella immaculata CRAWFORD '11b: 503.
Neotriozella ottawanensis PATCH '12b: 231.

Length of body 1.7 mm.; length of forewing 2.7; width of head 0.59. General color reddish brown to red; thorax lighter than abdomen;

vertex black to reddish with yellowish border; genal cones whitish, sometimes brown at tip; antennæ black; præscutum darker on anterior third; scutum with four brown stripes; legs light colored.

Head deflexed, broader than thorax, surface smooth, slightly pubescent; vertex broadly and shallowly impressed on each side of median line, front margin rather sharply defined, slightly emarginate over anterior ocellus. Genal cones longer than vertex, very slender, acuminate, acute at apex, vertical or even retrose, very sparsely pubescent. Antennæ slender.

Thorax arched, narrow, slightly punctate, sparsely and briefly pubescent. Pronotum short; præscutum about as long as broad, rounded narrowly cephalad. Wings rather long, hyaline, from two and a half to three times as long as broad, acute to subacute apically.

Genitalia.—*Male.*—Genital segment small; forceps spatulate, broadest at apex, a little shorter than anal valve; latter long, broader at base than at tip, rather densely pubescent. *Female.*—Genital segment half as long as rest of abdomen, tapering evenly to a very acute point; dorsal valve longer than ventral.

Described from one male from Algonquin, Illinois (Dr. Nason), the type, and two females from Ames, Iowa (C. W. Mally), May, 1895; one female from Washington, District of Columbia (Schwarz), October, 1883; one female "dipped from surface of ocean 94 miles from Nova Scotia, July 3, 1887." The latter bears the manuscript name of *Trioza proboscidia* Riley. Miss Patch's *N. ottawanensis*, two paratypes of which I have examined and found to belong to this same species, are from Ottawa and Aylmer, Ontario, Canada (W. Metcalfe), May, 1903 and 1905, one of them having been collected on "pine."

Type.—Cat. No. 18090, U. S. Nat. Mus.

NEOTRIOZELLA SCULPTOCONUS, new species.

Length of body 1.8 mm.; length of forewing 2.6. General color reddish to reddish brown; pronotum and hind margin of vertex whitish; vertex dark red with light margins; antennæ and genal cones black; legs light brown.

Head not, or slightly, broader than thorax, deflexed; vertex as in *immaculata*, slightly pubescent; genal cones a little longer than vertex, thicker than in congenors, closely approximate, vertical, subacute at tip, with rather coarse transverse striæ, scarcely pubescent, tipped with orange. Antennæ about twice as long as width of head, III a little thicker than succeeding segments.

Thorax somewhat arched, narrow, punctate. Legs slender, rather long. Wings hyaline, a little more than twice as long as broad, acute at apex; venation similar in type to that of congenors.

Genitalia.—*Male.*—Genitalia resemble those of *immaculata;* anal valve relatively longer and produced more into a posterior lobe; forceps broadest subapically, flattened at apex.

Described from two males from California, one from Placer County, the other from Castle Peak, Nevada County, both collected by A. Koebele in September.

Type.—Cat. No. 18091, U. S. Nat. Mus.

This is close to *immaculata*, in some respects, differing chiefly in head characters. One of the two specimens bears the manuscript name of *Trioza frontalis* Riley.

NEOTRIOZELLA LATICEPS Crawford.

Figs. 206, 214, 349, 538.

Trioza laticeps CRAWFORD '10a: 233.
Neotrioza laticeps CRAWFORD '11a: 450.
Neotriozella laticeps CRAWFORD '11b: 503.

Length of body 1.6 mm.; length of forewing 2.7; width of head 0.62. General color dark brown, thorax lighter; head and genal cones black.

Head strongly deflexed, distinctly broader than thorax, slightly punctate; vertex rather sharply defined on margin, scarcely impressed discally, slightly emarginate over front ocellus; genal cones not longer than vertex, acute, more abruptly converging to apex than in *immaculata*, vertical or retrose, slightly pubescent. Antennæ very slender.

Thorax arched, narrow, punctate, slightly pubescent. Wings hyaline, narrower than in *immaculata*, relatively longer usually, subacute at apex.

Genitalia.—*Female.*—Genital segment almost as long as rest of abdomen, very acute at apex; dorsal valve longer and larger than ventral, very acute.

Described from one female collected by G. R. Pilate in Louisiana. This is very close in many respects to *immaculata*.

Type.—Cat. No. 18092, U. S. Nat. Mus.

Genus CEROPSYLLA Riley.

Ceropsylla RILEY '83: 76.
Triozoida CRAWFORD '11b: 491.

Head deflexed, not as broad as thorax; vertex more or less plane, except postocellar areas conspicuously elevated, bulging lobately in front between antennal bases, with front ocellus not or scarcely visible from above; genal cones short to long, separated but not strongly divergent, vertical. Genæ swollen close behind antennal sockets; clypeus at least moderately large (very prominent in *johnsonii*). Antennæ usually not over twice as long as width of head. Thorax arched; pronotum short; strongly descending cephalad, depressed below level of vertex and præscutum. Hind tibiæ with two apical spines within, and one outside. Wings hyaline, usually acute at apex; basal vein (R + M + Cu) relatively longer than in most species of the genus *Trioza*, distinctly more than one-fourth the length of the wing (very long in *sideroxyli*); M and Cu sometimes petiolate at base, or with a distinct tendency toward such a character.

Type of genus.—Ceropsylla sideroxyli Riley.

The two species of *Triozoida* Crawford ('11b: 491) are closely enough related to Riley's species to justify placing them in the same genus and making *Triozoida* a synonym of *Ceropsylla*. The long basal vein (unusually long in the type-species), the type of origin of M and Cu with the tendency toward becoming petiolate, the general appearance of the vertex and genal cones all denote a mutual relationship. This was overlooked at the time of erecting the genus *Triozoida*, but since then specimens of *C. sideroxyli* have become available for comparison, and, therefore, this change is made.

SYNOPSIS OF SPECIES.

a^1. R+M+Cu longer than Rs; genal cones short, scarcely half as long as vertex; vertex very conspicuously bulging in front; M and Cu scarcely petiolate. *sideroxyli* Riley.

a^2. R+M+Cu shorter than Rs; genal cones nearly or fully as long as vertex.

  b^1. M and Cu scarcely or only slightly petiolate; clypeus subglobose; genal cones as long as vertex; antennæ whitish on basal third........*californica* Crawford.

  b^2. M and Cu distinctly petiolate; clypeus elongate, vertical, nearly as long as genal cones and similar in shape; genal cones not quite as long as vertex; antennæ black from base to tip....................................*johnsonii* Crawford.

CEROPSYLLA SIDEROXYLI Riley.

Figs. 138, 407.

Ceropsylla sideroxyli RILEY '83: 76.

Length of body 2.1 mm; length of forewing 2.9; width of head 0.74. General color greenish yellow on the upper side, abdomen and venter green; præscutum brownish on anterior half or two-thirds; head with a black area between antennæ, extending up around front ocellus and including genal cones; antennæ brown, greenish on basal half.

Head much narrower than thorax; vertex with posterior ocelli greatly elevated, rest of surface smooth, almost flat, a little more than half as long as broad between eyes, emarginate in front at median line (when viewed dorsally); view from in front shows vertex acutely angled downward with a subcircular elevated area around front ocellus; antennal sockets and genal cones more inferior than in *Trioza;* cones small, between and below antennal sockets, almost parallel to each other, vertical, blunt at apex, with a few long setæ. Eyes large. Antennæ not over twice as long as width of head, flattened and broadened at apex.

Thorax arched rather strongly, broad, finely strigate. Pronotum short; mesopleurites large; legs moderately stout. Wings long, transparent and clear, about two and a half times as long as broad, acute at apex; basal vein unusually long, longer than Rs, dark and heavy; Rs short; first marginal cell much larger than second.

Genitalia.—Male.—Anal valve large, almost as broad as long; posterior margin strongly arcuate, anterior nearly straight; forceps as long as anal valve, slender, sinuate (posterior view), and very acute at apex. *Female.* Genital segment short, not much longer than preceding ventral sclerite, not very acute at apex, dorsal valve a little larger and longer than ventral.

Described from eight males and females from Lake Worth, Florida (E. A. Schwarz), June.

Type.—Cat. No. 18093, U. S. Nat. Mus.

Riley stated that the larva of this species is very peculiar in form. "Full-grown larvæ were found by Mr. Wittfeld at Georgiana, in southern Florida, on the under side of leaves of *Sideroxylon masticodendron*, embedded in small, scattered, cup-shaped excavations, which on the upper side of the leaves appear as rough, elevated pustules. A white waxlike (not flocculent) excretion covers the dorsal surface of the larva and has suggested the generic name" (Riley). The immature forms of the other two species are not known yet.

CEROPSYLLA CALIFORNICA Crawford.

Trioza californica Crawford '10a:234.
Triozoida californica Crawford '11b:492.

Length of body 2 mm; length of forewing 3.35. General color dark brown to orange, head almost black, darker than thorax; abdomen greenish white ventrally, dorsally black; legs uniform reddish brown; antennæ brown to black, except segments II to III whitish.

Head almost as broad as thorax, finely punctate; vertex about half as long as broad, bulging in front roundly and emarginate at median line; postocellar areas not as much elevated as in the other two species; genal cones large, about as long as vertex, vertical, divergent slightly, subacute, coarsely punctate or strigate; clypeus globose, not unusually large. Eyes large. Antennæ scarcely twice as long as width of head, not very slender.

Thorax arched; præscutum moderately long, narrowly rounded cephalad. Wings hyaline, about two and a half times as long as broad, acute at apex; R+M+Cu and R very heavy and margined with black; anal angle narrowly black or brown; Rs short; M and Cu sometimes slightly petiolate; marginal cells subequal.

Genitalia.—Male.—Forceps (from side) scythe-shaped, with sharp edge cephalad; (from behind) swollen on basal half, apical half abruptly very slender and acuminate, arcuate outward, pubescent; anal valve short, with a long posterior lobate process from apical half at right angles to axis of valve. *Female.*—Genital segment short, not much longer than preceding segment, dorsal valve a little longer than ventral, subacute.

Described from eight males and females from: Claremont, California (C. F. Baker), Laguna Beach, California (Baker); Los Angeles, California (Coquillett); Argus Mountains, California (Koebele), April; Boulder, Colorado (S. A. Rohwer), on *Salix rostrata* (*bebbiana*), May 2, 1908.

Type in author's collection. The three specimens in the collection of the U. S. National Museum bear the label *Trioza ichneumonia* Riley, a manuscript name.

CEROPSYLLA JOHNSONII Crawford.

Figs. 156, 158, 496.

Triozoida johnsonii CRAWFORD '11b: 492.

Length of body 2.2 mm; length of forewing 3; width of head 0.78. General color light brown; vertex shining black; præscutum brown; hind legs light brown, others dark or black.

Head moderately broad, not quite as broad as thorax, scarcely punctate; postocellar regions unusually elevated; vertex smooth between posterior ocelli, roundly bulging in front and less emarginate at median line than in *californica;* anterior bulging less acute than in *sideroxyli* and more so than in *californica;* genal cones nearly as long as vertex, conspicuously separated from base to apex, vertical, blunt at tip, sparsely pubescent; with the elongated clypeus extending downward and visible behind and between cones, as long as latter and appearing as a third cone. Eyes large. Antennæ about twice as long as width of head, inserted almost directly in front of genal cones instead of at the side as in most other species of the family.

Thorax strongly arched; pronotum and præscutum rather stout. Wings transparent, almost three times as long as broad, slender, acute at apex; basal vein not as heavy as in *californica;* M and Cu distinctly petiolate; Rs short; second marginal cell much larger than first.

Genitalia.—*Male.*—Forceps almost as long as anal valve, simple, converging uniformly from base to tip, arcuate, toothed at apex, rather densely pubescent; anal valve with a short, subacute lobate process caudad from subapical portion of axis, pubescent.

Described from one male collected at Belize, British Honduras, by J. D. Johnson. No other data are given.

Type in author's collection.

This species, in general, is more closely related to *sideroxyli* than to *californica*, but in wing characters it is more closely related to the latter.

HEMITRIOZA, new genus.

Head much narrower than thorax, deflexed; vertex not raised platelike; genal cones not long, divergent; clypeus small. Eyes very small. Antennæ not more than twice as long as width of head. Thorax arched quite strongly; pronotum short, depressed below level of head and præscutum, descending strongly cephalad; propleurites as in *Trioza*. Hind tibiæ with three apical spines within and one outside; basal tarsus of hind legs without apical clawlike spines. Wings short, membranous; media and cubitus often with a long or short petiole or without one (varying on wings of individual); basal vein long. Male often much smaller than female.

Type of genus.—*Hemitrioza sonchi*, new species.

This genus is distinctly *triozine* in general form, but in wing venation it approaches *Psylla*. Its position seems to be more or less intermediate between *Psylla* and *Trioza*, hence the name.

HEMITRIOZA SONCHI, new species.

Fig. 402.

Trioza sonchi RILEY (*nomen nudum*), Proc. Amer. Ass. Adv. Sci., **32**:319.—AULMANN **13**:55.

Length of body, 1.7 mm; length of forewing, male, 2; female, 2.5. General color, red to orange; antennæ white, black at tip; beak black; fore and middle tibiæ and all tarsi whitish; wings with a broad reddish band across the middle and three spots on hind margin. Head and thorax coarsely punctate. Male much smaller than female.

Head rather small relatively; vertex more than half as long as broad, with a large foveal depression on each side of median line, emarginate in front over ocellus; genal cones not quite as long as vertex, broad at base, subacute, widely divergent, subvertical, pubescent. Eyes very small. Antennæ about twice as long as width of head, III thicker than succeeding segments.

Thorax rather strongly arched, broad; pronotum short; scutum large. Wings hyaline, relatively short, about twice as long as broad, conspicuously colored as described above; petiole of media and cubitus variable in length even on wings of an individual; radial sector very short; marginal cells subequal. Hind wings very small.

Genitalia.—*Male.*—Forceps about half as long as anal valve, thick at base and converging to apex to a sharp toothlike point, arcuate somewhat; anal valve rather large, elliptical (from side view), broadest at middle; forceps and anal valve quite densely pubescent.—*Female.*—Genital segment short, a little longer than preceding segment, dorsal valve longer than ventral.

Described from three males and two females from Virginia, October 9, 1881, on *Sonchus arvensis;* one male and three females from Washington, District of Columbia (E. A. Schwarz), June; many males, females, and nymphs from Atlanta, Géorgia (J. C. Bradley), July 6, 1909.

Type.—Cat. No. 18094, U. S. Nat. Mus.

The nymph of this species is distinctly *triozine* in form, being bordered completely by a dense fringe of long, white, hair-like processes, so characteristic of *Trioza* species.

Subfamily PSYLLINÆ.

Head more or less deflexed, sometimes perpendicularly so; vertex quadrate, semicircular, or subtriangulate; genæ produced into variously shaped lobes or cones beyond end of vertex; frons covered by genæ, visible only as a very small sclerite bearing front ocellus. Antennæ typically ten-segmented, long or short. Thorax usually well arched; sclerites of thorax variable, as described under tribes and genera. Hind tibiæ often with a spur at base, with five to twelve black spines at apex; basal tarsal segment of hind legs with a pair of black claw-like spines at apex. Wings variable from thick to hyaline, rhomboidal to elongate-ovate, seldom, if ever, ovate *and* at the same time acutely angled at apex, as in *Trioza;* media and cubitus always with a petiole.

There are grouped in this subfamily several genera not heretofore associated together. Several genera formerly placed in Aphalarinæ have been transferred to this group because of obviously close relationships one to another. The relative length of the cubital petiole (M+Cu) and the discoidal subcosta (R) has been the basis for separating certain of these genera into one or the other of Aphalarinæ or Psyllinæ, but this character is of little value and often separates widely two closely related species, or even two specimens of the same species.

A comparison of forms at opposite ends of the subfamily series does not show any apparently close similarities, and yet with the many intermediate forms before us, we readily see the inter-relationships and similarities of the various genera. The group has been, for convenience, divided into four tribes: Pachypsyllini, Euphyllurini, Arytainini, and Psyllini.

The principal and most distinctive characters of this subfamily are the concealed frons, the presence of genal cones or lobate processes, the presence of the apical claw-like spines on the posterior basal tarsus (not limited, however, to this group), and the presence of a cubital petiole (M+Cu). The following synoptic table shows the relationships of the tribes and genera to each other to a certain extent.

SYNOPSIS OF GENERA.

a^1. Vertex quadrate, flat, very large, perpendicularly inclined, or nearly so; wings seldom ovate.. Tribe *Pachypsyllini*.

b^1. Praescutum, pronotum and vertex perpendicularly inclined; wings very long, rhomboidal, subhyaline.............................. *Uhleria*, new genus.

b^2. Only the head and sometimes the pronotum perpendicularly inclined.

c^1. Wings subhyaline, not rhomboidal; antennae distinctly longer than width of head; genal cones rather large............... *Tetragonocephala*, new genus.

c^2. Wings thick, opaque, more or less rhomboidal; antennae short; genal cones small; vertex often not quite perpendicular, broadest at apex; insects gall-forming.. *Pachypsylla* Riley.

a^2. Vertex not quadrate, narrowed distinctly anteriorly, not perpendicularly inclined, but sometimes strongly descending.

b^1. Forewings strongly rhomboidal, usually thickened and opaque; vertex flat; genae produced into two transverse contiguous lobes on same plane with vertex. Tribe *Euphyllurini*.

c^1. Head and pronotum vertically inclined; eyes not covering propleurites; wings only semiopaque; dorsal head and thorax pubescent. *Katacephala*, new genus.

c^2. Head deflexed, but not perpendicularly inclined; eyes receding strongly, covering propleurites; wings opaque; head and thorax not pubescent. *Euphyllura* Förster.

b^2. Forewings elongate-ovate, sometimes with a rhomboidal tendency (see *Euphalerus propinquus*), usually hyaline or subhyaline, rarely opaque; genal cones not as above.

c^1. Pleural suture of prothorax extending to middle of lateral extremity of pronotum, which is more or less swollen and knob-like; propleurites subequal in length (see fig. 1)................................ Tribe *Arytainini*.

d^1. Vertex large, flat, more or less as in *Euphyllura*, with eyes strongly recessive; genal cones with vertex forming a uniformly flat surface; wings often subopaque... *Euphalerus* Schwarz.

d^2. Vertex smaller, less flat, with eyes less recessive; genal cones not as above; wings usually subopaque to hyaline.

e^1. Genal cones rounded at apex, not acutely conical, more or less parallel to plane of vertex; vertex bulging on each side of median line; thorax usually less strongly arched......................... *Arytaina* Förster.

e^2. Genal cones acutely conical, perpendicularly inclined; vertex not bulging in front on each side of median line; antennae rather long; wings hyaline; thorax well arched......................... *Psyllopsis* Loew.

c^2. Pleural suture of prothorax extending obliquely to posterior part of lateral extremity of pronotum, or not attaining to it at all; episternum longer than epimeron.. Tribe *Psyllini*.

d^1. Vertex with a longitudinal, whitish ridge along each side of median line, with a furrow outside of and between the two ridges; genal cones short and usually separated at base; antennae long.... *Mitrapsylla*, new genus.

d^2. Vertex without such ridges and furrows; genal cones various, usually conical.. *Psylla* Geoffroy.

Tribe PACHYPSYLLINI.

UHLERIA, new genus.

Head, pronotum, and praescutum perpendicularly inclined, with mesothorax exceedingly thick dorso-ventrally and anterior part of head about on same level with the ventral surface of mesothorax;

vertex very large, flat, square; genal cones small, subconical, flexed outward. Thorax very large; pronotum short; mesonotum ascending vertically to scutum, coarsely punctate. Legs thick. Wings very long, subhyaline, rhomboidal; cells long and narrow.

Type of genus.—*Uhleria mira*, new species.

This is a very aberrant and unusual genus, showing, however, marked relationships to other *Pachypsyllini* genera.

UHLERIA MIRA, new species.

Figs. 114, 115, 411.

Length of body 3.9 mm.; length of forewing 4.2; width of head 1.05. General color brown, variegated with flavous; an indefinite flavous stripe extending up each side of vertex over pronotum and on each side of praescutum, and meeting at posterior side of latter and extending as one median stripe over scutum; pleuræ variegated. Body very large.

Vertex nearly square, very slightly broader than long, with a shallow fovea on each side of median line, coarsely punctate; genal cones about one-fourth as long as vertex, flexed outward, rather acute at tips, slightly pubescent. (Antennæ broken off.)

Thorax very large, coarsely punctate. Pronotum short, broader at lateral extremities; praescutum relatively small. Mesoscutum exceedingly large, strongly arched. Wings about three times as long as broad, flavous and somewhat thickened, subhyaline or semi-opaque; posterior apical margin angulate; marginal cells very elongate and narrow; pterostigma rather large.

The genitalia of the single specimen (apparently a female) before me have been removed. The abdomen is very large at base and converges to a small apex.

Described from one female with no locality data, in the United States National Museum collection. It is probably an American species, however.

Type.—Cat. No. 18095, U. S. Nat. Mus.

This is such a remarkable and interesting species that it has seemed worth while to describe it, even without any locality data, in the hopes that future collecting will bring to light additional specimens. The name given to this species is that applied, in manuscript, to the same insect by Riley. It was apparently named after Dr. Philip Uhler.

TETRAGONOCEPHALA, new genus.

Head, and sometimes pronotum also, perpendicularly inclined; vertex flat, quadrate, rarely converging slightly toward front; genal cones rather large. Thorax strongly arched; pleurites of pronotum rather broad. Wings subhyaline, more or less elongate-ovate, cells long and narrow; pterostigma wanting.

Type of genus.—*Tetragonacephala flava*, new species.

TETRAGONOCEPHALA FLAVA, new species.

Figs. 128, 129, 418.

Length of body 2.7 mm.; length of forewing 4; width of head 0.92. General color flavous, with seven small black spots on mesonotum; antennæ black at tip.

Head vertical; vertex large, almost square, flat, punctate; genal cones about half as long as vertex, slightly divergent, rounded at apex, a little longer than broad in same plane with vertex. Antennæ about one and a third times as long as width of head, slender. Thorax strongly arched, punctate; pronotum moderately long, ascending. Legs long, a little longer than in *Katacephala*. Wings long, about two and a half times as long as broad, hyaline, scarcely rhomboidal, broadly rounded at apex; marginal cells long and narrow; pterostigma wanting.

Genitalia.—Male.—Genital segment partially retracted into preceding segment, very hairy; anal valve very large and broadly ovate, from caudal aspect; forceps long, gradually enlarging toward apex, with apical fourth converging again to a point; with long hairs on caudal surface.

Described from one male from Brownsville, Texas (H. S. Barber), May 13, 1904.

Type.—Cat. No. 18096, U. S. Nat. Mus.

Genus PACHYPSYLLA Riley.

Pachypsylla Riley '83:71.

Dorsum strongly arched; body robust. Vertex very large, almost square, flat except apical margin rounded down, nearly or quite perpendicularly inclined. Genal cones small, subconical, divergent. Antennæ short, seldom longer than width of head. Thorax large and broad; propleurites broad. Legs rather short. Wings more or less rhomboidal, often only slightly so, thickened, variously colored and maculated; marginal cells long and narrow; pterostigma present; veins usually setigerous.

Type of genus.—Pachypsylla venusta Osten Sacken.

This is a very interesting genus, whose distribution seems to be limited to the United States. The members are gall-makers on several species of hackberry (*Celtis* spp.), and apparently on no other plants.

SYNOPSIS OF SPECIES.

a^1. Body very large; length to tip of folded wings over 5 mm.; wings maculate apically. Gall large, spherical, polythalamous, on twigs or petioles..*venusta* Osten Sacken.

a^2. Length not over 4 mm. to tip of folded wings. Gall smaller, monothalamous.

  b^1. Vertex and thoracic dorsum pubescent; forewings scarcely rhomboidal, about two and a half times as long as broad, with a subapical, oblique, whitish band. Galls on leaves.

c¹. Body moderately large, seldom less than 3 mm. long to tip of folded wings. Gall mammiform, on under side of leaf, more or less pubescent, concave on upper side of leaf.......................................*c.-mamma* Riley.

c². Body small, seldom over 2.5 mm. to tip of folded wings; gall blister-like on both sides of the leaf, raised only slightly above surface of leaf. *c.-vesiculum* Riley.

b². Vertex and dorsum not pubescent; forewings more rhomboidal, not much over twice as long as broad, more or less wrinkled. Galls on petioles or small twigs.

c¹. Pterostigma indistinct, not black; head and thorax more or less flavous.

d¹. Forewings uniformly brownish...............................*c.-gemma* Riley.

d². Forewings finely mottled in apical portion...................*dubia* Patch.

d³. Forewings mottled and spotted, with an oblique, clear band subapically. *pallida* Patch.

c². Pterostigma black, prominent; head and thorax black, marked with flavous; marginal cells less narrow than in other species, the first shorter and more V-shaped than second; antennæ black; wings with a smoky band along anal and apical margins and extending along branching of veins toward base. Galls oblong-oval, located on twigs or base of larger limbs just beneath the bark. *inteneris* Mally.

The following species are too closely related to *c.-mamma* and *c.-vesiculum* to be easily distinguishable and have not been included in the synopsis:

c.-asterricus RILEY '90:618.—TUCKER '07:69.
c.-cucurbita RILEY '90:621.—BEUTENMÜLLER '92:276.—STEBBINS '10:33.
c.-globulus RILEY '90:621.
c.-minuta RILEY (MS?).—TUCKER '07:69.
c.-pubescens RILEY '90:620.
c.-umbilicus RILEY '90:619.
rohweri COCKERELL '10:180.

PACHYPSYLLA VENUSTA Osten Sacken.

Figs. 65, 66, 255, 451.

Psylla venusta OSTEN SACKEN '61:422.
Pachypsylla venusta RILEY '83:72.—BEUTENMÜLLER '92:274.—MALLY '93:137.
Pachypsylla c.-grandis RILEY '83:70.
Pachypsylla tridentata PATCH '12b:224.

Length of body 4.4 mm.; length of forewing 5.1; width of head 1.2. General color brown to brownish yellow, often more or less variegated with darker brown; thorax with longitudinal stripes. Body very large and massive.

Head vertical, large, with eyes much narrower than thorax; vertex very coarsely rugoso-punctate, straight on posterior margin, not converging toward front, rounded forward between anterior ocellus and posterior margin but not between eyes, quite coarsely pubescent, with a small fovea on each side of median line, otherwise plane; anterior margin slightly arcuate. Genal cones short, small, subacute at apex, projecting slightly forward from plane of vertex and sharply depressed and separated therefrom, distinctly divergent, slightly lel, rounded at apex, not close to forceps at base. *Female.*—Genital segment small and short, dorsal valve slightly longer than ventral and less acute; pubescence sparse.

Described from numerous males and females from Key West, Florida, and Cayamas, Cuba (Schwarz), on *Piscidia erythrina;* these are apparently paratypes; they are labeled *Euphalerus ficus* (MS) Riley in the United States National Museum collection—apparently an earlier manuscript name for the species. One female, also, from Belize, British Honduras (J. D. Johnson).

There is a certain amount of variation in the relative length of the genal cones and in the color of the body. The specimens from Cuba have relatively longer genal cones and are more conspicuously spotted. There is an indistinct white broken stripe on the dorsum from the vertex to the metascutum which scarcely is apparent in the Florida forms, but is quite distinct in the Cuba specimens. The Belize specimen resembles most closely the Florida forms.

This species has nest-making habits.[1]

EUPHALERUS RUGIPENNIS, new species.

Figs. 134, 406.

Length of body 2 mm; length of forewing 2.1; width of head 0.81. General color yellowish orange to reddish brown, with numerous irregular white spots scattered over surface of body and legs; abdomen lighter ventrad; legs yellowish. Body medium in size to small. Body surface coarsely punctate.

Head large, as broad as thorax, deflexed strongly, subvertical; vertex slightly impressed discally, not entirely flat, front margin rounded. Genal cones large, one-half to two-thirds as long as vertex, broadly rounded, not contiguous at base, divergent, not depressed below plane of vertex, pubescence white, conspicuous. Eyes large, recessive over propleurites. Antennæ slender, less than twice as long as width of head, black distad. Clypeus small.

Thorax strongly arched, broad; pronotum moderately long; propleurites narrow; mesonotum long. Legs short, stout. Forewings somewhat thickened, semihyaline, very conspicuously and coarsely rugose, about twice as long as broad, broadly rounded at apex; pterostigma rather broad at base; radial sector sinuate.

Genitalia.—Male.—Genitalia resembling somewhat those of *vermiculosus;* forceps slender, somewhat three-faced, with a black, acutely pointed tip; anal valve slender, long. *Female.*—Genital segment short, thick, acute at apex.

Described from twelve males and females from Oracle, Arizona (Hubbard and Schwarz), on (?) *Acacia gregii,* July; twelve specimens from Placer County, California (Koebele), on *Ceanothus cuneatus,* with numerous small impunctations over entire surface, each spot covering from three to five impunctations; with a band nearly free of spots extending from near tip of Rs obliquely to tip of Cu_1; about two and a half times as long as broad; first marginal cell smaller than second; veins with a double row of setæ.

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[1] A discussion of which see in Proc. Ent. Soc. Wash., vol 6, 1904, pp. 153, 239.

Genitalia.—*Male.*—Genital segment rather elongate; forceps not long, simple, slightly tapering to tip; anal valve long, similar in shape to *P. venusta*, arcuately bulging on hind margin and emarginate subapically. *Female.*—Genital segment about as long as rest of abdomen, similar in shape to that of *venusta.*

Described from many males and females from Ames, Iowa (C. W. Mally); Kansas (no data); Colorado (no data); several points in Texas: Plano (E. S. Tucker), October, November; Wills Point (F. C. Bishopp), March 15, 1904; Dallas, November to March; Ithaca, New York, 1893.

In the Fifth Report of the U. S. Entomological Commission (1890), pages 614–622, Riley describes the galls of several species of this genus. The adult insects of some of these species he has described in another paper, but for several closely related to *c.-mamma* he has described nothing but the gall. No authentic specimens of his species *c.-asteriscus*, *c.-umbilicus*, *c.-pubescens*, *c.-globulus*, *c.-cucurbita* and *c.-cucurbita* var?, are available, and therefore, with no description of the insect extant, nothing can be done at present, except to disregard these species until some knowledge of them is obtained. In all probability, all of these species are only variations of the species *c.-mamma*, since the insects are said to be very similar and the differences in the galls are not great. In the collections at hand there are large numbers of specimens belonging to and closely related to this species, forming a large series more or less continuous in variation. In all this series there are almost no structural differences at all, the only variations being in size of body and maculation of wings. The size of the body varies almost continuously from somewhat larger than the size given for *c.-mamma* to almost as small as *c.-vesiculum.* The spotting of the forewing varies in intensity within certain limits, but always the oblique, white band is present apically; the margins of this band are often darker than the rest of the wing surface, and sometimes a very dark band about as broad as the light band borders the latter on the inside. Although there exist in the series at hand several interruptions in continuous variation it is quite probable that more extensive collections will fill these gaps and demonstrate that this is a very widely variable species, instead of many species as stated by Riley.

In a large collection of galls one notices many variations in form and size. It is this fact that has given rise to many of the species listed above. After much careful study Mally ('93:136) has stated that these gall variations have no specific significance. He describes a wide range in form variation from the typical perpendicular, mammiform gall to a short, rounded gall without the nipple, or even concave at the end. He further states that a great many of these different galls were placed singly in pill boxes and the adults bred out. With a few possible exceptions, all the adults thus bred out were typical *c.-mamma*. A few he thought might be varietal forms. He concludes, and correctly I believe, that gall variations such as are described above have little or no specific significance. These several species listed above are therefore either identical with *c.-mamma* or are varietal forms of it.

PACHYPSYLLA C.-VESICULUM Riley.

Figs. 63, 241, 292, 454.

Pachypsylla celtidis-vesiculum RILEY '83b: '90:618.—BEUTENMÜLLER '92:275; '04:35.—JARVIS '06:65.—STEBBINS '10:33.

Very close to *c.-mamma*, differing as follows: Much smaller, about 2 mm. long to tip of folded wings, rarely over 2.5 mm., less robust; similar in general coloration except genal cones distinctly lighter than vertex; head usually less perpendicular. Genitalia relatively smaller. Wing venation not exactly similar (see figure). *Galls* distinctly different, blister-like and similar on both sides of leaf, never mammiform or elongate; often scarcely raised above surface of leaf.

Described from many males and females from Ames, Iowa (Mally), and from Ithaca, New York (Crawford), bred from *Celtis* galls, October, 1912.

PACHYPSYLLA C.-GEMMA Riley.

Figs. 67, 243, 453.

Pachypsylla celtidis-gemma RILEY '83:74.—BEUTENMÜLLER '92:275.—MALLY '93:138.

Length of body 3.2 mm.; length of forewing 3.3; width of head 1.2. General color yellowish brown, variable in shade; head and thorax dirty yellow with a tinge of brown. Body moderately large, robust, surface glossy, not pubescent.

Head almost vertical, much narrower than thorax; vertex large, straight on posterior margin, not converging toward front, not pubescent as in preceding species, with a shallow fovea on each side of median line, punctate; genal cones small, short, rounded apically, projecting outward and slightly forward from plane of vertex, sharply depressed and separated therefrom, divergent, pubescent. Antennæ very short, scarcely as long as width of head.

Thorax very large, massive, strongly arched, glabrous and very finely punctate. Pronotum not very long, almost vertical, lateral margin straight. Wings broad, large, rather rhomboidal, light brown throughout, coriaceous, about twice as long as broad, sides subparallel basally, rhomboidal apically, rather narrowly rounded at apex; marginal cells shorter than in typical species, but of similar form, first shorter than second; pterostigma short, indistinct; veins with double row of setæ; one specimen presents the anomaly of the entire absence of the second marginal cell in one forewing and the reduction of it to a very small cell in the other.

Genitalia.—*Male.*—Genital segment short; forceps rather small, simple; anal valve rather large, tapering roundly to apex on both margins. *Female.*—Genital segment about as long as rest of abdomen, dorsal valve longer than ventral.

Described from several males and females from Brownsville, Texas (Jones and Pratt), on *Celtis*, March 20, 1906; Corpus Christi, Texas (F. C. Pratt), April 13, 1906; Natchitoches, Louisiana (Cushman, and Pierce), on *Cratægus*, March 28, 1907; Cadet, Missouri, May, 1885; Des Moines River, Iowa (Mally); Virginia; Washington, District of Columbia (Schwarz), June 1. The record on *Cratægus* is the only instance of any member of this genus occurring on anything except *Celtis*.

This and the three following species differ from the others in having the body smooth instead of pubescent, but this scarcely warrants the recognition of a subgenus or a distinct genus, although Riley did place *c.-gemma* in the subgenus *Blastophysa*.

PACHYPSYLLA DUBIA Patch.

Pachypsylla dubia PATCH '12b: 224.

I have examined a paratype of this and the following species and both seem to be distinct from *c.-gemma*, though closely related. The chief difference is in the mottled appearance of the forewing instead of being uniformly brown.

Seven paratypes in the collection of Cornell University, but the locality is not given for any of them.

PACHYPSYLLA PALLIDA Patch.

Pachypsylla pallida PATCH '12b: 225.

Similar to *c.-gemma* in characters of head and thorax and shape of wings; color of wings somewhat resembling that of *c.-mamma*, with a clear, transverse, oblique band subapically and spotting on each side of band; this color, however, is less marked than in *c.-mamma*.

Described from one paratype from Arizona (no data).

PACHYPSYLLA INTENERIS Mally.

Pachypsylla inteneris MALLY '93: 138.

Closely related to *c. -gemma*, but differing in color and venation, as described in synoptic table. The characterization there is taken almost verbatim from Mally's short description, and it need not be repeated here. I have seen no specimens of this species.

Locality.—Ames, Iowa (C. W. Mally), on *Celtis* sp.

Tribe EUPHYLLURINI.

The most characteristic features of this tribe are the rhomboidal wings and the form of the genal lobes in front of the vertex. Two species of a new genus, *Katacephala*, are closely enough related to *Euphyllura* to be included in the same tribe although there are marked differences between the two.

It is interesting to note that *Katacephala* bears certain marked resemblances to the Pachypsyllini, while *Euphyllura* grades off into *Euphalerus* on the other side. With these intermediate forms before us it is easy to see the relationships of the various genera of this subfamily.

KATACEPHALA, new genus.

Head and pronotum perpendicularly inclined; vertex large, converging roundly toward front; genal lobes transverse, contiguous on inner margin, thicker than in *Euphyllura*, scarcely differentiated from vertex. Antennæ not much longer than width of head. Vertex and thoracic dorsum conspicuously pubescent. Thorax broad, and strongly arched. Legs very short. Wings rhomboidal, but much more hyaline than in *Euphyllura;* venation similar to latter; veins setigerous.

Type of genus.—*Katacephala grandiceps*, new species.

SYNOPSIS OF SPECIES.

a^1. Wings very strongly rhomboidal; antennæ not longer than width of head; head not retrose..*grandiceps*, new species.

a^2. Wings with rhomboidal angles more rounded; antennæ distinctly longer than width of head; head retrose............................*arcuata*, new species.

KATACEPHALA GRANDICEPS, new species.

Figs. 120, 121, 126, 127, 416.

Length of body 2 mm; length of forewing 2.7; width of head 1. General color brown to yellowish brown; eyes and genal lobes of male dark brown to black. Entire body surface clothed with a conspicuous pubescence. Body very stout, not large.

Head vertical, lying closely against prothorax and forecoxæ, as broad as thorax; vertex broader than long, anterior margin roundly arcuate, with an arcuate fossal depression parallel with front margin reaching about half way to the front. Genal lobes large, very thick, rounded in front, broader than long, lying against forecoxæ. Antennæ inserted between eye and genal lobe, about as long as width of head, black at tip. Eyes touching mesopleuræ; anterior ocellus at base of genal lobes, apparently remote from front margin of head.

Thorax broad, high; pronotum mostly covered by eyes; præscutum, scutum, and scutellum very large; pleurites large. Wings rhomboidal, semi-hyaline, slightly rugulose, almost twice as long as broad; pterostigma very long and narrow; marginal cells long, triangular; veins setigerous.

Genitalia.—Male.—Genital segment small. Forceps slender, simple, as long as anal valve, curved inward at apex, acute; anal valve slender, posterior margin sinuate. *Female.*—Genital segment as long as rest of abdomen, stout, dorsal valve a little longer than ventral.

Described from one pair collected on Long Island, Bahamas, by E. A. Schwarz, April, 1879, and one pair from Key West, Florida (Schwarz).

Type.—Cat. No. 18097, U. S. Nat. Mus.

KATACEPHALA ARCUATA, new species.

Figs. 61, 62, 450.

Length of body 2.9 mm.; length of forewing 3.6; width of head 1. General color brown throughout. Body quite large, very pubescent.

Head moderately large, vertical, not visible from above, retracted or retrose, not as broad as thorax, pubescent, punctate; vertex rounded, without foveæ, straight on posterior margin, converging from middle of eye to front ocellus. Genal lobes moderately large, contiguous on inner margin, broad, not depressed below plane of vertex, pubescent. Clypeus scarcely visible between head and forecoxæ. Front ocellus large, round, prominent. Antennæ longer than in preceding species.

Thorax unusually arched, broad, large, densely pubescent. Pronotum very long, vertical, in same plane with vertex and almost as long. Præscutum very large, more or less horizontal. Wings large, subhyaline, maculate on hind margin from margin to media, darker in second marginal cell, about two and one-third times as long as broad, rather angulate at apex, semi-rhomboidal; basal costa very thick, densely pubescent; all veins with a double row of setæ; marginal cells elongate, first longer than second; pterostigma long, pubescent.

Genitalia.—Female.—Genital segment about as long as rest of abdomen, similar in shape to *Pachypsylla;* dorsal valve longer than ventral.

Described from one female collected at Jalapa, Mexico (D. L. Crawford), August 28, 1910.

Type specimen in author's collection.

Genus EUPHYLLURA Förster.

Euphyllura Förster '48:93.

Body very robust, strongly arched, coarsely punctate, often more or less spotted. Head deflexed strongly, large, flat, as broad as thorax; vertex large, usually rather flat; genal lobes rectangular in shape and about as broad as vertex and not depressed from the level of vertex, contiguous on inner margin and either conjointly truncate or separately rounded slightly in front; anterior ocellus at base of genal lobes, apparently remote from front margin of vertex. Eyes large, strongly recessive and covering propleurites. Antennæ short, thick. Pronotum extending far down laterad to a point lower than base of forewings; propleurites short. Wings rhomboidal, coriaceous, not transparent, apex near anterior margin; second marginal cell often elongate.

Type of genus.—*Euphyllura phillyræ* Förster, a European species.

SYNOPSIS OF SPECIES.

a^1. Vertex very deeply emarginate over insertion of antennæ, with a prominent, rounded projection between emargination and front margin of eye; wings strongly rhomboidal.
  b^1. Wings brown, thick, transversely wrinkled; costa somewhat sinuate. *arctostaphyli* Schwarz.
  b^2. Wings white, rather powdery, sculpture concealed; costa not sinuate. *arctostaphyli neveipennis* Schwarz.

a^2. Vertex not emarginate over antennal insertion, or if so, not deeply; prominent projection wanting; wings rhomboidal, but not strongly so.
  b^1. Forewing bicolored, brown basally and light apically; forceps of male very slender, emarginate near apex on front margin, without tooth on hind margin; genal lobes moderately long............................*arbuti* Schwarz.
  b^2. Forewings uniformly brown; forceps of male rather stout, not emarginate at apex, with a distinct tooth on posterior inner margin about one-third the length from apex; genal lobes short.................*arbuticola*, new species.

EUPHYLLURA ARCTOSTAPHYLI Schwarz.

Figs. 32, 34, 279, 431.

Euphyllura arctostaphyli SCHWARZ '04:235.

Length of body 2.2 mm; length of forewing 3; width of head 1.18. General color reddish brown, varying from light to very dark, more or less conspicuously spotted; head and thorax reddish brown or brownish yellow; abdomen blood red; legs yellowish; forewings dark brown with a reddish tinge, more or less maculated with whitish, often with a prominent white fascia at basal third and sometimes a whitish area or fascia subapically.

Head as broad as thorax, strongly deflexed, rugose-punctate; vertex broader than long, emarginate over insertion of antennæ, nearly straight on posterior margin; genal lobes a little less than half as long as vertex, rectangular in shape, scarcely separated from vertex. Antennæ short. Eyes large; ocelli small.

Thorax very broad and strongly arched, less rugose than vertex but very coarsely punctate. Pronotum half as long as præscutum, ascending, covered laterad by receding eyes; scutum strongly convex. Wings thick, coriaceous, transversely rugose and rugulose, opaque, more or less maculated and not wholly constant in color, more rhomboidal than in *arbuti*, sides parallel to apical third, about twice as long as broad; marginal cells subequal; veins not sinuate; radial cell large.

Genitalia.—*Male.*—Anal valve long, slender, simple, a little longer than forceps, posterior edge concave, pubescent; forceps long, widening slightly toward apex, rounded at apex; posterior view shows forceps thin and subspatulate apically, densely fringed with hairs on inner margin. *Female.*—Genital segment moderately long, dorsal valve longer than ventral, margin regular, both acutely pointed.

Described from 12 males and females from Placer County, California (paratypes), collected by A. Koebele on *Arctostaphylus pungens*, September and October; several from Marble Valley, California (Koebele), July; Siskiyou County, California (Koebele); Oracle, Arizona (Hubbard and Schwarz); Colorado (Gillette); Easton, Washington (Koebele); and Big Horn Mountains, Wyoming (C. W. Metz), August.

Type.—Cat. No. 8143, U. S. Nat. Mus.

EUPHYLLURA ARCTOSTAPHYLI NEVEIPENNIS Schwarz.

Euphyllura arctostaphyli var. *neveipennis* SCHWARZ '04:235.

Form and structure similar to species; color variable, as in species; wings snow-white, sometimes with brown spots on apical margin, surface rather white-pulverulent in appearance, venation somewhat obscured. Genitalia somewhat similar, but forceps with the inner ridge and fringe of hairs much less conspicuous.

Described from nine specimens from Placer County, California (paratypes), collected by A. Koebele together with the typical specimens of the species, and several from Marble Valley, California (Koebele); Los Angeles, California (Koebele); and Pasadena, California (Grinnel).

EUPHYLLURA ARBUTI Schwarz.

Fig. 6.

Euphyllura arbuti SCHWARZ '04: 237.

Length of body 2.3 mm.; length of forewing 3.2; width of head 1.3. General color reddish brown to yellowish brown, venter and legs lighter; wings very light brown, but dark brown to black in front of claval suture. Body moderately large, robust.

Head strongly deflexed, as broad as thorax or broader, rugose, rather shining; vertex much broader than long, slightly convex; genal lobes thick, slightly shorter than in *arctostaphyli*, not depressed below vertex, a little lighter in color than vertex, very sparsely and briefly pubescent on front margin. Antennæ a little longer than in preceding species, slender. Eyes very recessive.

Thorax very broad and strongly arched, less rugose than vertex, coarsely punctate. Pronotum as in preceding species. Wings much less rhomboidal than in *arctostaphyli*, thick, coriaceous, almost opaque, especially on darker portions, about twice as long as broad, transversely wrinkled; first marginal cell small; medial veins and radial sector sinuate; pterostigma wanting; clavus large.

Genitalia.—Male.—Anal valve long, slender, simple, about one-third longer than forceps, tip rounded; forceps slender, converging a little toward apex, posterior edge straight, anterior edge deeply emarginate near apex making the tip hook-like in appearance, pubescent. *Female.*—Genital segment longer than in preceding species, dorsal valve longer than ventral, both acute at tip.

Redescribed from eight males and four females (which are paratypes) from Santa Cruz Mountains, California (Koebele), collected on *Arbutus menziezii* during July and August.

EUPHYLLURA ARBUTICOLA, new species.

This species resembles very closely *arbuti* in most respects, including size and general color, but differs in the color of the forewing, being uniformly darker brown and not bicolored, with sometimes a lighter area across the base; the venter is darker than in *arbuti*. Body a little more rugose. Genal lobes shorter, and more squarely truncate; antennæ slightly shorter. Head and thorax similar. Wings somewhat larger, thicker, more rugose; veins even more sinuate.

The chief difference is in the male genitalia; anal valve stouter, relatively shorter; forceps distinctly thicker, without apical emargination on anterior edge, and with a distinct tooth on posterior edge inside about one-third the length from apex, broadly rounded at apex.

Described from six males and four females from Chiric Mountains, Arizona (H. G. Hubbard), on *Arbutus arizonica*, in September.

Type.—Cat. No. 18098, U. S. Nat. Mus.

Tribe ARYTAININI.

The distinctive characters of this tribe are given in the synoptic table above.

Genus EUPHALERUS Schwarz.

Euphalerus SCHWARZ '04:239.

This genus was erected in 1904 by E. A. Schwarz for the single species *nidifex* from Key West, Florida. The addition to the genus of three new species necessitates a slight revision of the original generic description.

Body robust, surface punctate. Head vertical to subvertical; vertex broader than long, sides straight between eyes, then converging to front, truncate at front margin. Genal cones large, broad, rounded at apex, more or less divergent, not depressed below level of vertex, separated therefrom by a slightly impressed line. Antennæ short, slender. Thorax very convex transversely and longitudinally; propleurites long and narrow. Wings membranous, more or less hyaline, sometimes subopaque, oblong-oval or somewhat rhomboidal.

Type of genus.—Euphalerus nidifex Schwarz.

SYNOPSIS OF SPECIES.

a^1. Entire body surface including legs and wings speckled with brown or black dots and spots; vertex and pronotum very finely punctate, or smooth; eyes scarcely recessive; genal cones one-half to five-sixths as long as vertex . . *nidifex* Schwarz.

a^2. Body surface not speckled with brown or black spots or dots; vertex and notum coarsely punctate; eyes more recessive over propleurites.

  b^1. Forewings conspicuously and coarsely rugose; body surface and legs orange to brown with numerous white spots; forceps of male not terminating in a long hook-like process.................................*rugipennis*, new species.

  b^2. Forewings not rugose, semihyaline, more or less maculated apically. Vertex and notum very conspicuously vermiculo-punctate or rugose; forceps of male terminating in a long hook-like process.

    c^1. Forewings oval or only very slightly rhomboidal; genal cones nearly as long as vertex; forceps of male slender..............*vermiculosus*, new species.

    c^2. Forewings distinctly more rhomboidal, more maculated; genal cones one-half as long as vertex, broad; forceps of male very stout and thick. *propinquus*, new species.

EUPHALERUS NIDIFEX Schwarz.

Figs. 38, 40, 281, 433.

Euphalerus nidifex SCHWARZ '04: 153, 239.

Length of body 1.9 mm; length of forewing 2.1; width of head 0.90. General color greenish white, speckled with brown or black spots over entire surface, including legs and wings; antennæ tipped with black on each segment; wings maculated apically and covered over entire surface with dots.

Head deflexed, not as broad as thorax, finely punctate; vertex scarcely arcuate on posterior margin, almost flat, slightly raised along median line, rounded broadly on anterior margin, slightly emarginate over front ocellus. Genal cones large, broad, very obtuse at apex, varying in length from one-half to five-sixths as long as vertex, divergent only in apical half, continuing plane of vertex. Antennæ short.

Thorax broad, strongly arched, punctate, spotted. Pronotum moderately long, flat on dorsal surface; praescutum shorter than scutum. Wings subhyaline, except maculated apically, covered with dots on veins and membrane, about two and one-seventh times as long as broad, broadly rounded at apex; first marginal cell larger than second; pterostigma large.

Genitalia.—Male.—Genital segment relatively large; forceps rather small, slender, arched, acute at tip; anal valve longer, sides subparallel, rounded at apex, not close to forceps at base. *Female.*—Genital segment small and short, dorsal valve slightly longer than ventral and less acute; pubescence sparse.

Described from numerous males and females from Key West, Florida, and Cayamas, Cuba (Schwarz), on *Piscidia erythrina;* these are apparently paratypes; they are labeled *Euphalerus ficus* (MS) Riley in the United States National Museum collection—apparently an earlier manuscript name for the species. One female, also, from Belize, British Honduras (J. D. Johnson).

There is a certain amount of variation in the relative length of the genal cones and in the color of the body. The specimens from Cuba have relatively longer genal cones and are more conspicuously spotted. There is an indistinct white broken stripe on the dorsum from the vertex to the metascutum which scarcely is apparent in the Florida forms, but is quite distinct in the Cuba specimens. The Belize specimen resembles most closely the Florida forms.

This species has nest-making habits.[1]

EUPHALERUS RUGIPENNIS, new species.

Figs. 134, 406.

Length of body 2 mm; length of forewing 2.1; width of head 0.81. General color yellowish orange to reddish brown, with numerous irregular white spots scattered over surface of body and legs; abdomen lighter ventrad; legs yellowish. Body medium in size to small. Body surface coarsely punctate.

Head large, as broad as thorax, deflexed strongly, subvertical; vertex slightly impressed discally, not entirely flat, front margin rounded. Genal cones large, one-half to two-thirds as long as vertex, broadly rounded, not contiguous at base, divergent, not depressed below plane of vertex, pubescence white, conspicuous. Eyes large, recessive over propleurites. Antennæ slender, less than twice as long as width of head, black distad. Clypeus small.

Thorax strongly arched, broad; pronotum moderately long; propleurites narrow; mesonotum long. Legs short, stout. Forewings somewhat thickened, semihyaline, very conspicuously and coarsely rugose, about twice as long as broad, broadly rounded at apex; pterostigma rather broad at base; radial sector sinuate.

Genitalia.—*Male.*—Genitalia resembling somewhat those of *vermiculosus;* forceps slender, somewhat three-faced, with a black, acutely pointed tip; anal valve slender, long. *Female.*—Genital segment short, thick, acute at apex.

Described from twelve males and females from Oracle, Arizona (Hubbard and Schwarz), on (?) *Acacia gregii,* July; twelve specimens from Placer County, California (Koebele), on *Ceanothus cuneatus,* in September; nine from Los Angeles County, California (Koebele), on *Ceanothus rigidus*, in May. These are labeled *Cephalopsylla rugipennis*, Riley, a manuscript name.

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[1] A discussion of which see in Proc. Ent. Soc. Wash., vol 6, 1904, pp. 153, 239.

Type.—Cat. No. 18099, U. S. Nat. Mus.

The California specimens are uniformly a little smaller, lighter in color, and the forewings are a little less rugose. There seem to be no structural differences, however. One specimen of the Arizona lot is somewhat distinct in a few minor respects and seems to represent a varietal form of the species.

EUPHALERUS RUGIPENNIS IMMACULATUS, new variety.

Similar to the species in most respects; body surface finely punctate or very finely rugose, without white spots so characteristic of the species; genal cones about half as long as vertex, less pubescent.

Described from one female from Oracle, Arizona (Hubbard and Schwarz).

EUPHALERUS VERMICULOSUS, new species.

Figs. 39, 41, 225, 434.

Length of body 2.1 mm; length of forewing 2.4; width of head 0.98. General color greenish white; thorax darker, with numerous irregular brown spots.

Head subvertical, not deflexed below level of pronotum, long, narrow laterally, very markedly vermiculo-punctate, fully as broad as thorax; vertex flat, large, with a small but distinct fovea on each side of median line posteriorly, sides straight between eyes, then converging toward apex, truncate anteriorly; median line scarcely impressed. Genal cones large, continuous at base, slightly divergent, broadly rounded at apex, scarcely or not at all depressed below level of vertex, separated from vertex by a slightly impressed line, pubescence short. Antennæ short, with a conspicuous protuberance at base of insertion. Eyes large, recessive.

Thorax strongly arched longitudinally and transversely, coarsely punctate; pronotum vermiculo-punctate; præscutum rugoso-punctate. Pronotum long, broad, ascending; propleurites long, narrow, largely concealed behind receding eyes; scutum long, well arched. Hind tibiæ with a small tooth at base. Wings relatively small, subhyaline at base, fumate in apical third, often brown along apical margin, about twice as long as broad, very broadly rounded at apex, slightly rhomboidal; apical marginal vein often alternately white and black; marginal cells subequal; radial sector long, curved; pterostigma short, yellowish; claval suture prominent.

Genitalia.—*Male.*—Genital segment rather large; forceps slender, long, with a black, hook-like process at apex, pubescent; anal valve, large, long, broad, simple, truncate at apex, pubescent. *Female.*—Genital segment as in preceding species.

Described from one male from Claremont, California (C. F. Baker), one male from Eureka, California (H. S. Barber), on *Ceanothus* sp., in May, and numerous males and females from Placer County, California (Koebele), on *Ceanothus cordulatus*, in September, and in Siskiyou County, California. These are labeled in the National Museum collection *Cephalopsylla ceanothi* Riley (MS).

Type in author's collection.

EUPHALERUS PROPINQUUS, new species.

Figs. 131, 400.

Closely related to *vermiculosus*, but readily separated on the following characters: Head relatively broader; vertex much broader, more deeply vermiculo-punctate, without brown spots. Genal cones shorter, much broader, broadly rounded at apex, with apical portion turned outward a little. Wings somewhat rhomboidal, usually with a brown to black marginal band apically, more or less interrupted; venation similar, except Cu_1 distinctly shorter.

Genitalia.—*Male.*—Forceps stout, abruptly narrowed apically into a long, slender, hook-like process, longer than in *vermiculosus*, acute at tip and directed inward. Anal valve more rounded at apex, stouter.

Described from 13 males and females from Arizona, some of them from the Chiricahua Mountains, collected by H. G. Hubbard in September, on *Ceanothus*. These bear the label in the National Museum collection, *Cephalopsylla latifrons* Riley MS.

Type.—Cat. No. 18100, U. S. Nat. Mus.

Genus ARYTAINA Förster.

Arytaina FÖRSTER '48: 69.
Arytaena SCOTT '76: 528.—LOEW '78: 596.
Psyllopa CRAWFORD (n. n.) '11c: 628; '12b.

Resembling *Psylla* in many respects and sometimes difficult to distinguish therefrom; differing chiefly as follows: Genal cones usually short and very broadly rounded, seldom long and acute as in *Psylla*, extending parallel to plane of vertex but depressed below it, not widely divergent; pleurites of pronotum (see fig. 1) subequal in length, with pleural suture as in *Aphalara*. Wings usually more narrowly rounded at apex, often more or less maculated, spotted or marked, often less hyaline than in *Psylla*, but sometimes very similar to wings of *Psylla*. In other respects not differing markedly from *Psylla* in characters of antennæ, thorax except propleurites as noted above, legs including claw-like spines of basal tarsus of hind legs; basal spur of hind tibiæ seldom distinct, if present.

Type of genus.—*Arytaina genistæ* Latreille. This is the first species named in this genus by Förster and should be recognized as the type-species. There is no reason why the genus name should be spelled *Arytæna* instead of *Arytaina*, as Förster first used the name.

SYNOPSIS OF SPECIES.

a^1. Vertex and notum not or scarcely pubescent.
  b^1. Forewings conspicuously spotted, maculated, or entirely dark.
    c^1. Wings with numerous brown spots isolated or fused to form two irregular maculæ, one apical and the other subbasal; male genitalia simple; body surface and wings often pulverulent.................*robusta*, new species.
    c^2. Wings not as above; body surface and wings not pulverulent.
      d^1. Wings entirely brown to black, thickened, not at all transparent; forceps of male bi-lobate, large; genal cones rather large. *fuscipennis*, new species.
      d^2. Wings with one or two dark maculæ; forceps of male simple.
        e^1. Genal cones large; head often broader than thorax; male anal valve simple; notum often striped.
          f^1. Wings with a longitudinal brown macula between Rs and M; forceps large, broad, thick..............................*genistæ* Latreille.
          f^2. Wings clear except a conspicuous black spot at tip of clavus and sometimes a faint brown streak across base; forceps smaller, more slender; thoracic dorsum usually conspicuously striped and mottled. *ribesiæ* Crawford.
        e^2. Genal cones small; head not broader than thorax; wings with a brown band extending along posterior margin, thence toward primary furcation of basal vein; anal valve of male very large, with a large, angular posterior lobe about half as long as valve; forceps slender. *assimilis*, new species.
  b^2. Forewings not conspicuously maculated; hyaline or sometimes slightly fumate or browned apically.
    c^1. Wings more or less fumate, at least apically; body small.
      d^1. Female genital segment as long as rest of abdomen or longer; anal valve of male very broad at base, triangular in shape; forceps simple; vertex not emarginate at median line.....................*minuta*, new species.
      d^2. Female genital segment very short; anal valve of male not triangular; forceps deeply bifurcate at apex, processes slender, acute, parallel; vertex emarginate at median line in front.................*chelifera*, new species.
    c^2. Wings entirely clear or nearly so; body small; genal cones very small, short; antennæ short.
      d^1. Female genital segment converging uniformly to apex, not styliform.
        e^1. Forceps of male stout, with a long, large, anterior lobate process at or near apex; wings entirely clear.......................*amorphæ* Mally.
        e^2. Forceps of male slender, elongate, acute at apex, cultrate; wings sometimes indistinctly fumate at apex...............*ceanothæ*, new species.
      d^2. Female genital segment subglobose at base, with apical portion slender and styliform, very acute; genal cones as in two preceding species. *aculeata*, new species.
a^2. Head and notum conspicuously pubescent; forceps of male short and stout, with a long, slender, hook-like process at apex; wings brown at apex; vertex bulging on each side of median line in front...................*pubescens*, new species.

ARYTAINA ROBUSTA, new species.

Figs. 1, 50, 50a, 56, 236, 283, 285, 444, 445.

Length of body 1.8 mm.; length of forewing 2.3; width of head 0.95. General color very variable from greenish white to dark brown;

head often whitish or light brown with ventral surface of genal cones dark brown, or else uniformly brown to dark brown; thoracic dorsum very light to dark brown, more or less variegated; abdomen, venter, pleuræ of thorax, and legs usually distinctly darker, often very dark; forewings variable, either very light with small brown spots scattered over apical half or often the entire surface, or with these spots aggregated into a large irregular apical macula and another just below middle of wing, more or less separated, often with these maculæ very dark and more regular in outline and more distinctly separated by a transparent band. Body surface and wings often covered with a white powder which lends a whiter color to the insect and covers more or less the brown areas; very often the body and wings are glabrous without any powder or with only a slight amount. The latter are uniformly darker in general color. All these characters vary widely but gradually in a large series. Body rather small, but robust.

Head more or less deflexed, often almost vertical, sometimes less so, almost or quite as broad as thorax, punctate, often pulverulent; vertex large, broad, with a deep fovea on each side of median line discally, rounded and full on each side anteriorly, postocellar regions somewhat elevated. Genal cones rather large in comparison to some of its congenors, occasionally very large, broad at base, broadly rounded at apex or sometimes more narrowly rounded, more or less divergent, depressed below plane of vertex, briefly pubescent. Antennæ slender, about twice as long as width of head, or shorter, black apically.

Thorax broad, robust, strongly arched, often pulverulent, punctate. Pronotum rather long, more or less flat, with lateral enlargement medium to small in size; propleurites rather short. Wings relatively rather small, subhyaline, variously maculated as described above, often pulverulent, a little more than twice as long as broad, broadly rounded at apex; first marginal cell larger than second; pterostigma very small.

Genitalia.—*Male.*—Genital segment large; forceps slender, rather long, arched, cultrate, acute at apex; anal valve long, broadly ovate when viewed from behind, rounded acutely at apex. *Female.*—Genital segment not quite as long as rest of abdomen, acute; dorsal valve a little longer than ventral and less acute, with a tuft of long hairs midway on dorsal surface.

Described from over one hundred specimens of both sexes from the following localities: Colorado (C. F. Baker), mostly dark forms; Santa Rita Mountains, Arizona (Hubbard and Schwarz), June; Flagstaff, Arizona (Barber and Schwarz), July; Williams, Arizona (H. S. Barber), July; Chiricahua Mountains, Arizona (Hubbard), June, on *Ceanothus fendleri* (most of these are lighter forms); Placer

County, California (Koebele), September, on *Ceanothus cordulatus;* Siskiyou County, California (Koebele); Easton, Washington (Koebele).

Type in author's collection.

The species seems to be western in its distribution. The individuals of one locality show the variations mentioned above to a less extent than individuals of separated localities.

ARYTAINA FUSCIPENNIS, new species.

Figs. 51, 229, 233, 288, 447.

Length of body 1.9 mm.; length of forewing 2.2; width of head 0.99. General color dark brown, genal cones lighter in male, yellowish white.

Head rather strongly deflexed, often almost vertical, about as broad as thorax, finely punctate ; vertex arcuate on posterior margin, deeply excavated discally, almost glabrous, emarginate in front at median line, and bulging roundly on each side of emargination. Genal cones short, broad, rounded at apex, contiguous at base, slightly divergent, with short pubescence. Clypeus small. Antennæ about twice as long as width of head.

Thorax large, broad, strongly arched both longitudinally and transversely; praescutum rather short. Wings broad, relatively short, about twice as long as broad, darkly fumate, scarcely hyaline, subcoriaceous, broadly rounded at apex or very slightly rhomboidal; first marginal cell large; pterostigma rather small.

Genitalia.—*Male.*—Genital segment large, erect; forceps bilobate, long; inner lobe more slender and acute than outer and somewhat shorter, and scarcely visible in profile; petiolate base attenuate; outer lobe large; anal valve larger than forceps, convergent distad, quite broad at base, simple; pubescence long and dense. *Female.*—Genital segment moderately long, stout, rather small; dorsal valve longer and more acute than ventral; ventral valve stout, blunt at apex.

Described from several males and females from: Redwood Creek, Humboldt County, California (H. S. Barber), on "White Myrtle," in June; Siskiyou County, California (Koebele), on *Ceanothus;* North Bend, British Columbia (Schwarz), on *Ceanothus sanguineus;* Ormsby County, Nevada (C. F. Baker); Colorado (Baker). The U. S. National Museum specimens are labeled *Euglyptoneura tristis* Schwarz, a manuscript name.

Type.—Cat. No. 18101, U. S. Nat. Mus.

ARYTAINA GENISTÆ Latreille.

Figs. 42, 227, 276, 436.

Psylla genistae Latreille 1810: 382.—Loew '77: 125.
Psylla ulicis Curtis '35: 565.
Psylla spartii Hartig, Germar Zeit. Ent., 3: 375.—Flor '61: 358.
Arytaina spartii Foerster '48: 69.—Meyer-Dür '71: 405.

Arytaena ulicis Scott '76:529.
Arytaena genistae Loew '78:597; '88:19.—Scott '80:132.—Reuter '81:162.—Edwards '96:250.—Sulc '05:4.—Oshanin '07:366.
Psyllopa magna Crawford '11c:628.

Length of body (male) 2.1 mm.; (female) 2.5; length of forewing 3; width of head 1. General color light brown to brown; thoracic dorsum more or less distinctly striped; genal cones, and often vertex too, lighter colored; antennæ dark, fuscous at base; legs light brown to yellowish, tarsi yellowish; forewings with a brown macula between Rs and M in apical half, and a continuous or broken macula on posterior margin apically.

Head broad, often broader than thorax, not strongly deflexed; vertex large, nearly half as long as broad, with two small foveæ as usual, bulging in front on each side of median line above genal cones, somewhat emarginate at median line; genal cones nearly as long as their basal width, broadly rounded at apex and only slightly divergent, pubescent. Antennæ a little more than twice as long as width of head.

Thorax large, broad, not strongly arched. Pronotum long. Hind tibiæ with a small spur at base. Wings hyaline, maculated as described above, elongate, more than two and a half times as long as broad, narrowly rounded at apex; pterostigma small.

Genitalia.—Male.—Anal valve not much longer than forceps, simple, pubescent; forceps thick and rather large, somewhat constricted midway, apex broadened and bifurcate with a short posterior point and a longer anterior process; pubescence silky. *Female.*—Genital segment almost as long as rest of abdomen; dorsal valve longer than ventral, both acute at apex.

Described from many males and females from Woods Hole, Massachusetts (T. D. A. Cockerell), on *Spartinum* sp.

This species is widely distributed in Europe, and probably has been brought into the eastern part of this country on some nursery stock. The identity of *Psyllopa magna* with this species was not discovered until some time after the publication of the description of the former.

ARYTAINA RIBESIÆ Crawford.

Figs. 83, 84, 252, 253, 304, 306, 468, 470.

Psyllopa ribesiæ Crawford '11c:630.

Length of body (male) 2.2 mm; (female) 2.7 to 3.3; length of forewing 3 to 4; width of head 0.90 to 1.08. General color very light brown (probably the more immature specimens) to brown or dark blackish brown; thoracic dorsum with more or less pronounced stripes; vertex variable from uniform reddish brown to mottled brown and whitish; abdomen usually darker; antennæ dark; fuscous at base; legs light to dark.

Somewhat similar to *genistæ* in general size and appearance, but differing sharply in several respects. Head often broader than thorax; genal cones variable from very broad and not longer than basal width to narrower and one-third longer than basal width, only a little divergent, rounded at apex, sometimes rather narrowly rounded. Antennæ usually about twice as long as width of head.

Thorax often more strongly arched, large; hind tibiæ with basal spur smaller, or wanting. Wings large, hyaline, or sometimes with a slight brownish tinge, with a black spot at tip of clavus and sometimes a more or less distinct brown area across wing base, about two and a half times as long as broad, somewhat narrowed toward apex; venation similar to preceding species in general; pterostigma small.

Genitalia.—*Male.*—Anal valve much longer than forceps, somewhat narrowed toward apex; forceps rather short, slender, converging toward tip, latter subacute. *Female.*—Genital segment thick at base, usually about half as long as rest of abdomen, dorsal valve slightly longer than ventral, both acute or subacute.

Described from numerous specimens of both sexes from: Boulder, Colorado (E. Bethel), on *Ribes longiflorum;* Fort Collins, Colorado (C. P. Gillette), on *Rhus trilobata*, September 27, 1894; Poudr River, Colorado, "sweeping on low bushes," June 28, 1883; Colorado (no data); Williams, Arizona (Barber and Schwarz), July 27; Ogden, Utah (Koebele), "on currant" (*Ribes* sp.), June, 1885; Los Angeles, California (Coquillett), on *Ribes aureum*, March 28; same locality, on *Ceanothus divaricatus*, June 8, 1887; Placer County, California (Koebele), on *Ceanothus cordulatus* ?

Type in author's collection.

This species has been known more or less commonly by Riley's manuscript name of *Psylla ribis*, but this is not the same as Miss Patch's species of that name.

ARYTAINA ASSIMILIS, new species.

Figs. 57, 237, 448.

Length of body 1.9 mm; length of forewing 2.2; width of head 0.80. General color reddish brown, lighter on dorsum and head. Body rather small, long.

Head relatively rather small, deflexed quite strongly, about as broad as thorax, punctate; vertex arcuate on posterior margin, with a deep fovea on each side of median line near center, slightly bulging in front on each side of median line, not strongly elevated on post-ocellar regions; genal cones rather short, contiguous at base, rounded broadly at apex, slightly pubescent. Antennæ a little more than twice as long as width of head, slender.

Thorax arched strongly, robust, punctate. Pronotum rather long, flat on dorsal surface; propleurites short. Wings small, sub-hyaline, maculate in middle and on hind margin conspicuously so, semitransparent, a little more than twice as long as broad, broadly rounded at apex and apical half of wing distinctly narrowing toward apex; first marginal cell larger than second; radial sector long and curved; pterostigma long, large at base.

Genitalia.—*Male.*—Genital segment very large, about half as large as rest of abdomen; forceps moderately long, stout, roundly acute at tip; anal valve very large, larger than forceps, with a large, lobate protuberance on hind margin; pubescence short.

Described from one male from Claremont, California (Crawford), on *Ceanothus crassifolius.* This form is manifestly distinct from *A. ceanothæ,* but was taken on the same tree and together with the specimens of the other species.

Type in author's collection.

ARYTAINA MINUTA, new species.

Figs. 60, 234, 286, 446.

Length of body 1.9 mm.; length of forewing 2.4; width of head 0.88. General color light brown, abdomen darker.

Head not strongly deflexed, not quite as broad as thorax, punctate. Vertex with a fovea on each side of median line, arcuate on posterior margin, with a swollen area on each side of front ocellus. Genal cones short, rounded, broad, contiguous at base, divergent, somewhat descending from plane of vertex. Antennæ rather short, slender.

Thorax not strongly arched, coarsely punctate. Pronotum relatively rather long, with lateral foveæ prominent; præscutum short. Wings small, slender, about two and a half times as long as broad, hyaline, maculate apically, roundly acute at apex; marginal cells subequal; radial sector long, straight; pterostigma long, narrow, yellowish.

Genitalia.—*Male.*—Genital segment large, rounded; forceps moderately short, simple, curved; anal valve obtriangular, large, with the long axis anterior; pubescence sparse. *Female.*—Genital segment much longer than rest of abdomen, which is usually rather short, acute at apex; dorsal valve longer than ventral.

Described from one male and seven females collected at Claremont, California (C. F. Baker); several from Los Angeles, California (Koebele), (Coquillett), on *Ceanothus sp.*, in May.

Type in author's collection.

ARYTAINA CHELIFERA, new species.

Figs. 135, 136, 412.

Length of body 1.7 mm; length of forewing 2.3; width of head 0.84. General color greenish yellow; genitalia, tip of antennæ, and venter more or less browned; forewings very slightly fumate, browned a little darker on apical fourth. Body small.

Head moderately deflexed, almost as broad as thorax; vertex almost semicircular in outline, conspicuously emarginate in front at median line and bulging roundly on each side of this. Genal cones about one-third as long as vertex, divergent, narrowly rounded at apex, pubescent, considerably below plane of vertex but extending parallel to it. Clypeus moderately large. Antennæ not much longer than width of head, slender.

Thorax long; pronotum long and rather flat transversely; propleurites very short and small. Wings a little less than two and a half times as long as broad, broadly rounded at apex; hyaline, slightly rugose, fumate more darkly at apex.

Genitalia.—*Male.*—Genital segment rather small; forceps moderately small, deeply bifurcate at apex, the two processes slender, acute, parallel, the posterior one a little longer than the other. Anal valve small, broad at base when viewed from behind. *Female.*—Genital segment very short, dorsal valve longer than ventral, ventral very short; both acute.

Described from many males and females from Williams, Arizona (Barber and Schwarz), July; American Forks, Utah (Hubbard and Schwarz), on *Purshia tridentata*, June 23. These bear the manuscript name of *Brachypsylla purshiæ* Schwarz.

Type.—Cat. No. 18102, U. S. Nat. Mus.

ARYTAINA AMORPHÆ Mally.

Figs. 63, 235, 299, 441.

Psylla amorphæ MALLY '94:159.
Psyllopa floridensis CRAWFORD '11c:629; '12b.
Psyllopa ilicis CRAWFORD (not Ashmead) '11c: :629; '12b.

Length of body 1.4 mm.; length of forewing 1.8; width of head 0.69. General color light greenish yellow throughout. Body very small, not very robust.

Head small, deflexed, about as broad as thorax, punctate. Vertex arcuate on posterior margin, elevated on postocellar regions, with a distinct fovea and sulcate impression on each side of median line. Genal cones very short, broad, broadly rounded at apex, sharply depressed below vertex, slightly pubescent. Eyes relatively large. Antennæ short, not twice as long as width of head.

Thorax relatively long, well arched, coarsely punctate. Pronotum small, short. Præscutum long, arched. Wings small, subcoriaceous, whitish, semitransparent, not maculate, about two and two-thirds times as long as broad, sides subparallel, quite broadly rounded at apex, very slightly rhomboidal; first marginal cell a little larger than second; pterostigma long, three-fourths as long as radial sector.

Genitalia.—*Male.*—Genital segment relatively moderately large. Forceps short and thick, with a large lobate process projecting horizonatally toward anal valve from near apex; with a tooth at apex of forceps and one at about the middle of the posterior process. Anal valve long, rather broad, sides subparallel, slightly recurved. *Female.*—Genital segment not as long as rest of abdomen; dorsal valve only slightly longer than ventral, very acute at apex.

Described from seven males and females from Ames, Iowa (C. W. Mally) and four from Luverne, Iowa (Mally), and six from Westpoint, Nebraska, all on *Amorpha canescens*, from March to June. The latter specimens in the United States National Museum collection are labeled *Amblyrhina fractiforceps* Riley, a manuscript name.

After careful comparison of more specimens it seems evident that the Florida species which I erroneously named *Psyllopa ilicis* (Ashmead) in a former paper[1] is identical with *amorphæ*. The Florida specimens are considerably smaller than many of the Iowa forms, but some of the latter are very small also. In structure they are very similar. If we allow for a certain amount of variation in size and minor characters, such as length of antennæ, etc., we can not recognize the two lots as even varietally distinct. The difference in food habits is interesting but not unusual. The *ilicis* species of Ashmead, according to several determined specimens in the United States National Museum collection, is neither an *Arytaina* nor an *Aphalara*, but belongs to a new genus, *Paurocephala*. (See p. 43.)

ARYTAINA CEANOTHÆ, new species.

Figs. 58, 240, 290, 442.

Length of body 1.7 mm.; length of forewing 2.3; width of head 0.70. General color yellowish to light brown to dark brown; on the darker forms the dorsum, vertex, and legs are light brownish yellow. Body very small.

Head strongly deflexed, about as broad as thorax, punctate. Vertex arcuate on posterior margin, with a deep and prominent fovea on each side and often a deep sulcate impression also, elevated roundly on postocellar regions, bulging forward on each side of median line. Genal cones very short, small, broadly rounded, much depressed below level of vertex, divergent, not always easily visible from above, slightly pubescent. Clypeus very large. Eyes rather large. Antennæ about twice as long as width of head, slender.

Thorax strongly arched, rather broad and stout, coarsely punctate. Wings small, rather transparent, oblong-ovate, broadly rounded at apex, about two and one-fourth times as long as broad; second marginal cell smaller than first; pterostigma nearly half as long as radial sector; apex of wing sometimes indistinctly fumate.

Genitalia.—*Male.*—Genital segment rather long, semiovate; forceps very long and very slender, roundly acute at tip. Anal valve

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[1] Pomona Journal of Entomology, vol. 3, 1911, p. 629.

not much longer than forceps, roundly tapering to tip, subacute at apex. *Female.*—Genital segment almost as long as rest of abdomen, broad at base, acuminate, very acute at apex; dorsal valve somewhat longer than ventral, equally acute.

Described from many males and females collected at Claremont, California, by D. L. Crawford, on *Ceanothus crassifolius;* found in very great numbers and in all stages of development in the middle of April; three from Los Angeles, California (Coquillett), April, on the same host plant; twenty-two from Santa Clara County, California (Koebele), May, on *Ceanothus rigidus;* eight from Eureka, California (H. S. Barber), May, on *Ceanothus*, and one from Scotia, California (Barber), May; several from Claremont, California, on *Rhamnus* sp.

Type in author's collection.

ARYTAINA ACULEATA, new species.

Similar to *amorphæ* and *ceanothæ* in size and general appearance, with whitish thoracic markings as in the former, and head as in the latter; differing from both in female genital segment, which is subglobose at base and produced caudad into a slender, black, styliform process not as long as the large basal portion. Wings as in *amorphæ*, but first marginal cell much shorter and pterostigma much smaller.

Described from three females from California, two of them from Santa Cruz Mountains (Koebele), and the other from Los Angeles (Coquillet), no data accompanying either, but the latter specimen was placed with several specimens of *ceanothæ* collected on *Ceanothus crassifolius*, April 1, in the same locality.

Type.—Cat. No. 18103, U. S. Nat. Mus.

ARYTAINA PUBESCENS, new species.

Figs. 52, 232, 287, 443.

Length of body 1.6 mm.; length of forewing 2; width of head 0.86. General color light brown, head greenish white, scutellum with several light-colored stripes. Body small.

Head small, deflexed, about as broad as thorax, punctate, conspicuously pubescent. Vertex rather flat, pubescent, arcuate on posterior margin, elevated on postocellar regions, roundly bulging in front on each side of median line. Genal cones short, broad, broadly rounded, somewhat pubescent. Antennæ short, moderately slender.

Thorax arched strongly, coarsely punctate and pubescent. Pronotum rather long, arched, with a prominent knob like lateral termination. Præscutum moderately flat. Wings small, subcoriaceous, whitish, maculate on apical third, and a macula at base of media; marginal cells subequal, moderately large; pterostigma not very large; about two and one-third times as long as broad, slightly rhomboidal in outline, broadly rounded at apex.

Genitalia.—*Male.*—Genital segment small, inconspicuous; forceps small, short, stout, with a black hook-like spine at tip; anal valve relatively not very long, curved, simple, sides subparallel. *Female.*—Genital segment short, retracted into abdomen beneath; dorsal valve longer than ventral, with a prominent convexity dorsad; ventral valve short, acute at tip, with a long projection laterad toward dorsal convexity.

Described from numerous males and females collected in Ormsby County, Nevada, by C. F. Baker, and four specimens from Colorado (Baker); fourteen from Placer County, California (Koebele), September, on *Purshia tridentata*, eleven from Nevada County, California (Koebele), September, on same host, and four from Siskiyou County, California (Koebele).

Type in author's collection.

Genus PSYLLOPSIS Loew.

Psyllopsis Loew '78:587.

Head deflexed rather strongly; vertex not sharply defined on anterior margin but merged into genæ; genal cones perpendicularly inclined, acutely conical, divergent, not continuing plane of vertex. Antennæ at least moderately long. Thorax well arched; pleural suture of prothorax as in *Arytaina*, but pronotum not knoblike at lateral termination. Wings ovate, subhyaline, usually with a pterostigma.

Type of genus.—*Psyllopsis fraxinicola* Förster.

SYNOPSIS OF SPECIES.

a^1. Antennæ about two and a half times as long as width of head; first marginal cell not twice as large as second; male anal valve very broad in lateral aspect. *fraxinicola* Förster.

a^2. Antennæ over four times as long as width of head; first marginal cell three times as large as second; male anal valve slender................*mexicana*, new species.

PSYLLOPSIS FRAXINICOLA Förster.

Figs. 21, 47, 230, 280, 439.

Psylla fraxinicola Förster '48:73.—Meyer-Dür '71:399.—Scott '76:544.—Loew '77:138.

Psyllopsis fraxinicola Loew '78:588; '88:14.—Reuter '81:153.—Scott '86:281.—Edwards '96:234.—Sulc '06:2.—Oshanin '07:348.—Felt '11:39.

Psylla viridula Förster '48:74.—Meyer-Dür '71:399.

Psylla fraxinola Meyer-Dür '71:398.

Psylla unicolor Flor '60:479; '61:340, 347 353.

Psylla chlorogenes Meyer-Dür '71:399.

Length of body, 2.5 mm.; length of forewing, 3.2; width of head, 0.90. General color, greenish-yellow throughout.

Head strongly deflexed, not quite as broad as thorax, punctate; vertex anteriorly roundly sloping down toward genal cones, without sharp marginal line in front differentiating it from genæ. Genal cones moderately long, conical, divergent, rather acute at apex, slightly pubescent, deflexed from plane of vertex and descending almost vertically. Antennæ slender, about two and a half times as long as width of head.

Thorax strongly arched, coarsely punctate; pronotum long, ascending toward præscutum; latter rather long. Wings moderately large, oblong-ovate, hyaline, slightly flavous, a little more than twice as long as broad, broadly rounded at apex; pterostigma long, closed, yellow; radial margin with setæ.

Genitalia.—*Male.*—Genital segment large; forceps relatively short, shaped like an ax blade, narrow at base, very broad at apex and convexly rounded, with a large thick process on inner posterior margin near base projecting inward to meet the process of the other side; anal valve large, long, greatly broadened basally, profile triangular. *Female.*—Genital segment short, stout, not very acute at apex, valves subequal in length.

Described from one pair from England (James Edwards), four specimens from Scotland (O. M. Reuter); eight from Washington, District of Columbia (Hubbard and Schwarz), June; and about sixty from Stanford University (H. Morrison), on leaves of *Fraxinus* sp., in May. One female belonging to this species, or very closely related, was taken on walnut leaves (*Juglans regia*) at Richfield Springs, New York, in August, 1897; reported by E. P. Felt ('10: 39) as injuring leaves of *Fraxinus* at Rochester, New York. The species probably has a wider distribution than these records show.

PSYLLOPSIS MEXICANA, new species.

Figs. 46, 228, 438.

Length of body 2.2 mm.; length of forewing 3.1; width of head 0.92. General color brownish yellow throughout. Body of medium size.

Head about as broad as thorax, coarsely punctate, strongly descending; vertex with a sulcate fovea on each side of median line extending obliquely toward median line, anterior margin not sharply defined, rounded downward toward genal cones. Genal cones almost as long as vertex, projecting down almost vertically, scarcely divergent, subacute at apex, pubescent. Clypeus large. Antennæ very long and slender, fully as long as body or over four times as long as width of head.

Thorax strongly arched, broad, coarsely punctate. Pronotum long, ascending, distinctly broadened at median dorsal portion, with lateral extremities rather narrow. Hind tibiæ with a small spur at base. Wings elongate, almost three times as long as broad, sides subparallel, rounded at apex, hyaline, slightly browned, transparent; first marginal cell much larger than second; pterostigma long and narrow; veins dark brown.

Genitalia.—Male.—Genital segment small, rounded; forceps long, arched, acuminate, acute at apex; anal valve long, slightly broadened at middle, converging toward tip. Described from one male from Acapulco, Mexico (C. F. Baker).

Type in author's collection.

Tribe PSYLLINI.

MITRAPSYLLA, new genus.

Body moderately large, not strongly arched on dorsal surface, usually more or less variegated in color. Head not strongly deflexed; vertex rather large, with a prominent ridge along each side of median line and a furrow between and outside of these ridges, converging to a rather acutely angled apex in front; genal cones very short, porrect, divergent. Eyes somewhat recessive. Antennæ long and slender. Thorax rather broad. Hind tibiæ with a small tooth at base. Wings subhyaline, broadly ovate, with a pterostigma.

Type of genus.—*Mitrapsylla albalineata*, new species.

MITRAPSYLLA ALBALINEATA, new species.

Figs. 78, 79, 249, 300, 465.

Length of body 2.4 mm.; length of forewing 2.8; width of head 0.91. General color light to dark brown ground color, with white markings and stripes; vertex with a white stripe on each side near median line and a white spot below each posterior ocellus; pronotum with two white stripes continuing those on vertex; præscutum with a white stripe on median line and one on each lateral margin; scutum with a median stripe and one on each side; pleuræ with several conspicuous white spots.

Head scarcely deflexed, moderately large, fully as broad as thorax, finely punctate; vertex broad posteriorly, converging evenly toward front, the whole more or less triangular in outline, with a conspicuous ridge on each side of median line (white), and a furrow between these and on the outside of each, produced in front into a rather acute point on each side of median line. Genal cones short, relatively thick, depressed a little below level of vertex, divergent, acute at apex, very sparsely pubescent. Antennæ long, over three times as long as width of head, slender, apical portion of each segment dark.

Thorax not strongly arched, coarsely punctate; præscutum moderately large. Hind tibiæ with a small spur at base. Wings rather small, subhyaline, more or less transparent, slightly browned or fumate along veins or sometimes the whole surface slightly fumate, a little more than twice as long as broad, broadly rounded at apex; pterostigma small, distinct.

Genitalia.—Male.—Genital segment relatively large; forceps long, thick, simple; anal valve long, broadest at base, slightly constricted midway. *Female.*—Genital segment fully as long as rest of abdomen, deflexed, acuminate; dorsal valve longer than ventral; pubescence very sparse.

Described from many males and females collected at Chinandega, Nicaragua, by C. F. Baker, San Marcos, Nicaragua (Baker), Acajutla, Salvador (Baker), Acapulco, Mexico (Baker), and Oaxaca, Mexico (Crawford). No biological data with these.

Type in author's collection.

The white markings are very conspicuous and constant in extent and color. A few specimens present variations in color not worthy of varietal names but deserving of mention. Two males, one from Chinandega and the other from Granada, Nicaragua, have the thoracic stripes a very dirty yellowish white and the cephalic stripes almost wanting entirely. The four specimens from Oaxaca, Mexico, are uniformly darker in color, almost black, the wings deep yellow; in two of them the stripes are almost wanting on the vertex and yellowish on the thorax, while in the other two the stripes are white and conspicuous and the eyes are whitish. The species seems to be distributed very widely throughout the American tropics and more extensive collections will probably complete the variation series in color. The size and structure is quite constant throughout the one hundred or more specimens before me.

MITRAPSYLLA CUBANA, new species.

Length of body, 2.1 mm.; length of forewing, 2.5. General color light brown; præscutum and scutum with light yellowish stripes placed as in the preceding species.

This species resembles quite closely the related species *albalineata* in many respects, differing in the following characters: Body smaller than in related species. Vertex with a deep sulcate depression posteriorly between ocelli and median line, with the ridges along the median line very prominent but not striped with white. Genal cones similar. Pronotum without stripes, unicolored; pleurites of prothorax longer and narrower. Wings small, hyaline, transparent, not in the least fumate or yellow; venation more or less similar. Genitalia similar except that the female genital segment is narrower and more acuminate and not deflexed.

Described from one female from Havana, Cuba (C. F. Baker).

Type in author's collection.

Genus PSYLLA Geoffroy.

Psylla Geoffroy 1762:482.—Scott '76:530.—Loew '78:600.—Froggatt '01:243.

Dorsum arched, usually strongly so; head broad, nearly as broad as or broader than thorax, more or less deflexed; vertex usually elevated at posterior ocelli. Genal cones always present, variable in shape, more or less coniform and [illegible] deflexed and depressed from plane of vertex. Eyes large, hemispherical; front between and in front of lobes of vertex, with the frons not at all, or sometimes very slightly, visible around the ocellus. Antennæ slender, at least as long as width of head, usually much longer, typically ten-segmented. Thorax broad; pronotum relatively longer than in *Trioza*, ascending; pleural suture of prothorax oblique, not extending to middle of lateral extremity of pronotum, but to its posterior edge or often not attaining to it at all. Præscutum long. Legs usually long and strong; hind tibiæ often with a distinct spur or tooth at base behind and with five or six black spines at apex; basal tarsus of hind legs with two black, claw-like spines at apex, lying one on each side of second tarsus. Forewings hyaline, transparent, rounded at apex, never angulate; cubitus and media always with a distinct petiole, which is usually distinctly shorter than the basal portion of radius (discoidal subcosta); pterostigma nearly always present; veins set with more or less visible setæ, usually bi-seriately.

Type of genus.—*Psylla alni* Linnæus (*Chermes*).

The first use of the name *Psylla* was by Geoffroy[1] in 1762. He described the genus *Psylla* but named no species within it, merely indicating nine species by a brief Latin diagnosis. His nomenclature, therefore, was binary but not binomial. This is a case exactly parallel with that of Gronow's which is treated at length by the International Committee on Nomenclature, and, since the generic names used in the latter case are considered valid, there is no reason why Geoffroy's *Psylla* should not, also, be valid.

No species was indicated by Geoffroy as the type-species, but in 1810 Latreille (1810: 264) described the genus again and made *Chermes alni* Linnæus the type-species.

Lamarck (1801: 298) redescribed the genus in 1801 and named under it the single species *Ch. ficus* Linnæus, but there is no evidence whatever to show that he designated this as the type-species. In some genera he named two or several species and before each, in every case, he placed a star. He offers no explanation of the significance of the star. Kirkaldy in 1904 ('04: 254) made *Psylla* a synonym of *Chermes* because, he stated, Lamarck had fixed the type of the latter as *Chermes ficus* Linnæus, which is a Psyllid and not an Aphid. As a matter of fact, Lamarck does not describe *Chermes* at all, but, as pointed out above, mentions *ficus* under *Psylla*. Kirkaldy's contention, therefore, is groundless.

It is true that the original description of *Chermes* by Linnæus fits more decidedly the Psyllid group than it does Aphids or Coccids. He included within it, however, species which have been subsequently placed in each of these families. Geoffroy's *Psylla* was not, apparently, intended for a substitute for *Chermes*, as Kirkaldy contended, but only to take in part of it. Since a type-species has been designated for *Psylla* since 1810 and since Passerini in 1865 designated an Aphid species as the type of *Chermes*,[1] it is impossible to consider *Psylla* as a synonym of the latter.

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[1] Histoire Abrégée des Insectes, vol. 1, 1762, p. 482.

The genus has been redefined several times (see bibliography above), and various species have been designated as type. The valid type, however, is *alni* Linnæus, as set by Latreille.

Foerster ('48: 67) has divided the original genus into many distinct genera, most of which are still valid. Franz Loew ('78: 600) defined *Psylla* as it is to-day regarded. It is a very large genus and its members are subject to considerable variation, thereby rendering it difficult to determine specific lines in many cases.

SYNOPSIS OF SPECIES.

a^1. Antennæ not over two and a half times as long as width of head (except sometimes in *brevistigmata*); length to tip of folded wings distinctly less than 5 mm.

  b^1. Antennæ less than twice width of head, or at most not more than twice.

    c^1. Hind tibiæ without spur at base,[2] or if present very small and indistinct.

      d^1. Forceps of male not simple; wings clear, transparent.

        e^1. Male forceps very broad at base, abruptly constricted near base, thence slender; anal valve long, sides subparallel; vertex only slightly emarginate in front at median line .... *fibulata*, new species.

        e^2. Male forceps with posterior margin conspicuously sinuate, apical third slender, acute; anal valve converging to tip; vertex more deeply emarginate in front .... *sinuata*, new species.

        e^3. Male forceps converging to near apex, then abruptly broadened and T-shaped; antennæ less than one and a half times width of head. *parallela*, new species.

      d^2. Forceps of male simple, sides subparallel or converging to apex; wings usually more or less fumate or maculate, sometimes clear.

        e^1. Wings maculate on posterior and apical margins and along Cu to its furcation; pterostigma short; female genital segment exceedingly short. *maculata*, new species.

        e^2. Wings not maculate but more or less fumate, or clear; pterostigma rather long; female genital segment not exceedingly short.

          f^1. Antennæ scarcely longer than width of head .... *breviata* Patch.

          f^2. Antennæ about one and a half to two times as long as width of head.

            g^1. Body very small, less than 3 mm. to tip of folded wings; wings small.

              h^1. Wings fumate in apical half, without spot at tip of clavus; genal cones separate at base and strongly divergent.

                i^1. Forceps of male 0.30 mm. long or more, converging to a simple, acute tip, pubescent almost uniformly from base to tip; body dark .... *minuta*, new species.

                i^2. Forceps of male 0.20 mm. or less, apex not simply pointed; scarcely pubescent on distal half; body lighter in color. *coryli* Patch.

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[1] I do not know whether or not this was the earliest date at which the type of *Chermes* was set, but it certainly was not set before 1810.

[2] If the hind leg is cleared and mounted on a glass slide, and examined under high magnification, a spur will be found on practically every species of the genus. The above key refers, however, to a lower magnification and the specimen not mounted on a slide.

h^2. Wings clear; genal cones not separate at base and not strongly divergent.

i^1. Color of body whitish; wings without black spot at tip of clavus. *alba*, new species.

i^2. Color of body flavous to reddish brown, with dark markings on thoracic dorsum; wings with a prominent black spot at tip of clavus........................*pyricola* Förster (summer form).

g^2. Body larger, more than 3 mm. long to tip of folded wings, usually more nearly 4 mm.

h^1. Female genital segment short, less than half as long as rest of abdomen; antennæ nearly twice as long as width of head; wings fumate..........................*pyricola* Förster (winter form).

h^2. Female genital segment as long as rest of abdomen, or nearly so.

i^1. Antennæ nearly twice as long as width of head; dorsal valve of female genital segment downcurved; wings yellow. *hartigii* Flor.

i^2. Antennæ variable from one and one-fourth to one and three-fourths as long as width of head; dorsal valve of female genital segment not downcurved; wings variable in color.

j^1. Wings with a black spot at tip of clavus...*quadrilineata* Fitch.

j^2. Wings without black spot at tip of clavus.

k^1. Body reddish brown to blackish; wing veins black.

l^1. Genal cones reddish or orange at tips; male anal valve not much longer than forceps; forceps converging to apex.

m^1. Male forceps large, .45 to .50 mm long; female genital segment very slender........*americana*, new species.

m^2. Male forceps smaller, .25 to .30 mm long, more densely pubescent; female genital segment stouter at base. *americana minor*, new variety.

l^2. Genal cones unicolorous to tip; male anal valve more than twice as long as forceps; forceps broad, flexed, apex broadly truncate..........................*ribis* Patch.

k^2. Body light flavous to orange; wing veins flavous; genal cones not darker at tip; male forceps about as long as in *americana minor*......................*americana flava*, new variety.

c^2. Hind tibiæ with a distinct spur at base behind; pterostigma long.

d^1. Female genital segment not as long as rest of abdomen, not very large; genal cones not quite as long as vertex; antennæ scarcely one and a half times as long as width of head..........................*alaskensis* Ashmead.

d^2. Female genital segment elongate, longer than rest of abdomen, or at least as long; antennæ nearly twice as long as width of head.

e^1. Genal cones longer than vertex; female genital segment unusually large and thick..................................*magnicauda*, new species.

e^2. Genal cones not as long as vertex; female genital segment not unusually large, more elongate and acute at end...................*striata* Patch.

b^2. Antennæ more than twice as long as width of head; body usually larger than in preceding species.

c^1. Female genital segment longer than rest of abdomen; pterostigma usually small.

d^1. Genal cones acute or subacute at apex as long as vertex or longer; Cu_1 not strongly arched................................*carpinicola*, new name.

d^2. Genal cones broadly rounded at apex, only a little divergent, about as long as vertex; Cu_1 more strongly arched.............*cephalica*, new species.

c^2. Female genital segment shorter than rest of abdomen.

d^1. Pterostigma of forewing long; head very broad, with a short, constricted, stalk-like area between inner margin of eye and elevated portion of vertex and posterior ocellus; genal cones not separated at base; color greenish yellow.

e^1. Antennæ conspicuously annulated with black on basal half. *annulata* Fitch.

e^2. Antennæ uniformly yellowish, except terminal segment black. *negundinis* Mally.

d^2. Pterostigma of forewing very short, broad at base; eyes not stalked, vertex extending uniformly to base of eyes; genal cones separated at base, strongly divergent; color orange to red, vertex often bordered with white, and genal cones white or pale on basal half.

e^1. Male forceps converging to a simple point, not acuminate. *brevistigmata* Patch.

e^2. Male forceps more slender, more acuminate, and turned forward in apical third, bluntly pointed................*brevistigmata acuta*, new variety.

a^2. Antennæ distinctly over two and a half times as long as width of head, sometimes much more.

b^1. Body very large, length to tip of folded wings at least 5 mm., seldom less; antennæ nearly or more than three times as long as width of head.

c^1. Pterostigma almost obsolete; basal spur on hind tibiæ small.

d^1. Female genital segment longer than rest of abdomen, very slender and acuminate, abruptly enlarged at base; male forceps subacute at tip, not notched..*floccosa* Patch.

d^2. Female genital segment shorter than rest of abdomen, thick and stout; male forceps more or less notched at apex, or bifid.

e^1. Color of body nearly uniformly greenish yellow, or with an orange tinge; genal cones subacute...........................*astigmata*, new species.

e^2. Color similar but with three large conspicuous red spots on thoracic dorsum; genal cones acutely pointed.....................*trimaculata* Crawford.

e^3. Color of head and thoracic dorsum rosy, abdomen vermillion with a black spot at base dorsad, and five transverse black bands. *cerasi* Patch.

c^2. Pterostigma distinctly present, usually rather large and long; basal spur on hind tibiæ larger.

d^1. Genal cones not as long as their basal width, very broadly rounded, about as long as vertex or shorter; forceps of male broadened apically; female genital segment as long as or often longer than rest of abdomen. *alni americana*, new variety.

d^2. Genal cones distinctly longer than their basal width, more or less acute at apex.

e^1. Female genital segment nearly as long as rest of body, acuminate, strongly upcurved, with an apparent suture about midway across both valves; color of body dark brown, notum striped..........*caudata*, new species.

e^2. Female genital segment only about three-fifths as long as rest of body, not upcurved, without the apparent suture; color of body typically green. *galeaformis* Patch.

b^2. Body small, scarcely over 3 mm. long to tip of folded wings; antennæ extremely long and slender, more than four times as long as width of head; basal spur on hind tibiæ large; male forceps not simple.

c^1. Genal cones moderately long, coniform, not quite as long as vertex.

d^1. Wings less than twice as long as broad, rather square on apical margin; pterostigma short...............................*torrida*, new species.

d^2. Wings larger, more than twice as long as broad, broadly rounded at apex; pterostigma half as long as Rs.................. *orizabensis*, new species.

e^2. Genal cones very short, rounded at tips; wings twice as long as broad. *minuticona*, new species.

PSYLLA FIBULATA, new species.

Figs. 98, 266, 314, 482.

Length of body 1.6 to 1.9 mm.; length of forewing 2.6; width of head 0.81. General color light yellowish green throughout; antennæ black distally.

Vertex scarcely half as long as broad, bulging forward in front on each side of median line, with a shallow fovea on each side posteriorly; genal cones about as long as vertex, not strongly divergent, subacute, pubescent. Antennæ about one and a half times as long as width of head.

Thorax strongly arched. Legs rather stout; hind tibiæ about as long as femora, without a spur at base, or if present it is very small. Wings hyaline, slightly whitish in color, about two and a half times as long as broad, venation as in illustration; pterostigma long and rather narrow.

Genitalia.—*Male.*—Anal valve long, much longer than forceps, sides subparallel, pubescence short; forceps enlarged at base, acute at apex, front margin nearly straight, posterior margin deeply concave making basal portion unusually large and distal half slender, acuminate, slightly pubescent. *Female.*—Genital segment about as long as rest of abdomen, dorsal valve distinctly longer than ventral, slender at apex.

Described from several males and females from Colorado (no data) collection of C. F. Baker.

Type.—Cat. No. 18104, U. S. Nat. Mus.

PSYLLA SINUATA, new species.

Figs. 267, 268, 491.

Length of body 1.9 to 2.1 mm.; length of forewing 3.1; width of head 0.89. General color greenish yellow, antennæ black on distal half or third.

Similar to *fibulata*, but differing as follows: Body and wings larger; vertex relatively a little longer; genal cones longer. Hind tibiæ with a minute spur at base, scarcely visible. Male forceps longer, with posterior margin sinuate conspicuously, with long pubescence, apical portions slender and strongly bowed inward. Female genital segment similar but larger and thicker.

Described from several males and females from Pagosa Springs, Colorado (C. F. Baker); these bear the manuscript name of *Psylla fibulata simulans* Crawford; several from Ungava Bay, Labrador (L. M. Turner), July 22, seem undoubtedly to belong to this same species.

Type.—Cat. No. 18105, U. S. Nat. Mus.

PSYLLA PARALLELA, new species.

Closely related to *fibulata*, differing as follows: Vertex more emarginate in front at median line; genal cones not quite as long as vertex; antennæ only about one and a fourth times as long as width of head. Hind tibiæ with basal spur very small or wanting. Wings clear, similar in shape and venation to preceding species; pterostigma long, yellow-opaque. Male forceps a little shorter than anal valve, middle somewhat enlarged, then converging to near apex where an abrupt broadening produces a T-shaped apex. Female genital segment as long as rest of abdomen, slender, dorsal valve longer than ventral.

Described from four males and one female from Nevada County, California (Koebele), September.

Type.—Cat. No. 18106, U. S. Nat. Mus.

PSYLLA MACULATA, new species.

Figs. 100, 315, 485.

Length of body 1.5 mm.; length of forewing 2.2; width of head 0.85. General color dark brown; vertex, posterior half of pronotum; praescutum caudad, scutum dorsad, lighter brown to yellowish; facial cones tipped with brown. Body small.

Similar to *P. americana*, but vertex slightly pubescent, bulging forward in front a little more; genal cones about as long as vertex, separate at base, not deflexed much from plane of vertex. Antennæ not quite twice as long as width of head. Basal spur of hind tibiæ very minute. Wings maculate on posterior apical margin and along cubitus. Female genital segment very short and small; dorsal valve scarcely longer than ventral.

Described from one female from Colorado (C. F. Baker).

Type.—Cat. No. 18107, U. S. Nat. Mus.

PSYLLA BREVIATA Patch.

Fig. 123.

Psylla breviata PATCH 12b: 220.

Length of body 2.5 mm.; length of forewing 2.9; width of head 0.89. General color greenish yellow; antennæ black at tip.

Vertex a trifle more than half as long as broad, with a shallow depression on each side discally; genal cones about two-thirds as long as vertex, divergent, subacute at apex, slightly pubescent. Antennæ short, only a little longer than width of head. Thorax as in preceding species. Legs slender; hind tibiæ with a very small spur at base (easily visible in a balsam mount). Wings typical in shape and venation, slightly yellowish in apical half; pterostigma long.

Genitalia.—*Male.*—Anal valve longer than forceps, of usual form, elongate with sides subparallel, pubescent; forceps rather slender and long, sides straight and nearly parallel to near apex, then the anterior margin is conspicuously emarginate, making a terminal tooth-like process (fig. 133). *Female.*—Genital segment about as long as rest of abdomen, stout; dorsal valve longer than ventral, slender distad, pubescent.

Described from one female (paratype), mounted in balsam, from Dow's Swamp, Ottawa, Ontario, Canada (W. Metcalfe), June 14, 1903 (this specimen, together with paratypes of several other species, was loaned to me by Miss E. M. Patch; her description of this species was based on three females only); several males and females from Marquette, Michigan (Hubbard and Schwarz), July 27; Placer County and Nevada County, California (A. Koebele), September; Argus Mountains, California (Koebele), on *Pinus monophylla*, May, 1891. It is possible that the latter do not belong to this species.

PSYLLA MINUTA, new species.

Figs. 99, 261, 316, 483.

Length of body (male) 1.4 mm.; (female) 1.8; length of forewing 1.8; width of head 0.75. General color brown to dark brown or black; thoracic dorsum and vertex light brown to brown, sometimes dark; scutum with stripes of a lighter color; antennæ mostly dark; femora and tibiæ usually mostly brown or darker. Body small.

Vertex a little more than half as long as broad, bulging forward narrowly on each side of front ocellus, somewhat pubescent, with a round fovea on each side discally; genal cones slender, strongly divergent, separated at base, acute at apex, not quite as long as vertex, with several long setæ distad; antennæ one and a half to one and three-fourths times as long as width of head, slender.

Thorax very strongly arched, with very sparse pubescence. Legs slender; hind tibiæ with basal spur very small or wanting. Wings small, venation typical, conspicuously fumate in apical half, sometimes darkly so; pterostigma long, rather large.

Genitalia.—*Male.*—Anal valve a little longer than forceps, broad (in caudal view), apex rounded, pubescent; forceps about 0.30 mm. long or more, converging to a simple black point at apex, entire surface rather densely covered with large, heavy spine-like setæ. *Female.*—Genital segment as long as rest of abdomen or longer, acutely pointed, broad at base, dorsal valve longer than ventral.

Described from numerous males and females from American Fork Cañon, Utah (Hubbard and Schwarz), on *Purshia tridentata*, June 13; Williams, Arizona (Barber and Schwarz), on *Purshia tridentata*, May 25–28; Argus Mountains, California (Koebele), May, 1891; Ormsby County, Nevada (Baker); a number more from Colorado, with no data. Some of these specimens bear the manuscript name of *Psylla purshiæ* Riley, and *Brachypsylla purshiæ*.

Type.—Cat. No. 18108, U. S. Nat. Mus.

PSYLLA CORYLI Patch.

Very similar to *minuta* in most respects, including size and general proportions; color lighter. Vertex less pubescent, similar in form. Male anal valve similar; forceps distinctly shorter, not over 0.20 mm. in length, with similar spine-like setæ on inner surface, but only on basal half; apex with a conspicuous notch on outside near tip, giving he appearance of an inner apical tooth. Female not known to me.

Described from one male (paratype) from Colorado (no data), kindly loaned to me by Miss Patch. This species is exceedingly close to *minuta*, and were it not for the constant difference in the male genitalia I would not hesitate to include them both in one species.

It should be noted that the manuscript name of *Psylla coryli* Riley has been attached to another species, represented in the National Museum collection, which is close to *carpinicola* (Fitch's *carpini*). Miss Patch states that the present species also was known by the same manuscript name.

PSYLLA ALBA, new species.

Figs. 254, 321, 490.

Length of body (male) 1.6 mm; (female) 1.9; length of forewing 2 to 2.2; width of head 0.69. General color greenish white; antennæ black at tip.

Vertex about half as long as broad, with two foveæ as usual, bulging in front rather roundly; genal cones nearly or fully as long as vertex, not strongly divergent, subacute, pubescent. Antennæ about one and three-fourths times as long as width of head.

Thorax not strongly arched. Legs small, short; hind tibiæ about as long as femora, with basal spur very small or wanting. Wings whitish, clear, typical in shape and venation; pterostigma moderately large.

Genitalia.—*Male.*—Anal valve longer than usual, of usual elongate form, pubescent; forceps small, simple, rather strongly bowed, slender, acutely pointed at tips. *Female.*—Genital segment about as long as rest of abdomen, dorsal valve a little longer than ventral.

Described from many specimens of both sexes from Ormsby County, Nevada (C. F. Baker); Claremont, California (Baker); Sacramento, California, on *Salix longifolia*, July; Folsom, California (Koebele), on same host plant; Las Vegas, New Mexico (Barber and Schwarz), August 8; El Paso, Texas (Cockerell), May 13. Some of these bear the manuscript name of *Psylla americana alba* Crawford.

Type in author's collection.

PSYLLA PYRICOLA Förster.

Figs. 8, 13, 14.

Psylla pyricola FÖRSTER **'48**:77.—SCOTT **'76**:137; **'83**:205.—LOEW **'82**:247; **'84**:148; **'86**:156; **'88**:15.—SAJO **'95**:28.—EDWARDS **'96**:240.—SULC **'05**:2; **'10**:34.—KUWAYAMA **'08**:163 (Japan).—RILEY **'84**:69; **'91**:127 (abstract of Loew **'86**:156).—RILEY and HOWARD **'93**:226.—SLINGERLAND **'92**:159–186; **'96**:69–86.—LINTNER **'93**:317.—MALLY **'94**:153 (mention).—MARLATT **'95a**: 175–185; **'95b**:(Circular 7).—SMITH **'96**:137; **'09**:109 (mention).—PATCH **'11a**:11; **'12b**:221.
Psylla apiophila FÖRSTER **'48**:78.—LOEW **'77**:137; **'82**:232.
Psylla notata FLOR **'61**:365.—LOEW **'82**:244.
Psylla pyrisuga BARNARD, Proc. Amer. Ass. Adv. Sci., vol. 28, 1879, p. 478.
Psylla pyri CURTIS, Gard. Chron. **1842**:156.—HARRIS, Inj. Insects, **1852**:201; (for several more brief articles see Slingerland **'92**:186.)
Psylla simulans SLINGERLAND **'92**:186.
(?) *Psylla argyrostigma* FÖRSTER **'48**:97.

Summer form.—Length of body (male) 1.5 mm; (female), 1.9; length of forewing 1.7 to 1.9; length to tip of folded wings 2.1 to 2.8; width of head 0.78. General color light orange to reddish brown, with darker markings; vertex, genal cones, scutum between stripes, male genitalia, legs except hind femora, antennæ except at tip, light brown to orange; genal cones lighter colored at apex than at base.

Head very strongly deflexed; vertex about half as long as broad, with two foveæ, conspicuously emarginate in front at median line with front ocellus in emargination; genal cones about two-thirds as long as vertex, not strongly divergent, subacute at tips, pubescent. Antennæ about one and a half times as long as width of head, slender.

Thorax strongly arched. Legs slender; hind tibiæ with basal spur very small, or wanting. Wings transparent, clear or often with a slight yellowish tinge, especially in the distal cells; with a conspicuous black spot at tip of clavus; pterostigma long and relatively broad; venation typical.

Genitalia.—*Male.*—Anal valve a little longer than forceps, sides subparallel, pubescent; forceps simple, rather acute at tips, tapering uniformly from base to tip, about as long as in *coryli* Patch. *Female.*—Genital segment short, scarcely longer than two preceding segments, dorsal valve a little longer than ventral, both acute.

Winter form.—Differs from summer form chiefly in being larger and darker in color. Length to tip of folded wings 3.3 to 4 mm.; other measurements proportionate; nearly one-third longer. General color very dark reddish brown to black; markings black; areas noted in summer form as lighter are correspondingly a little lighter here, but antennæ mostly dark from base to tip; wings darker on basal portion, apically clear, veins black and very conspicuous, black claval spot more pronounced.

Described from numerous males and females from Ithaca, New York, and several other near-by localities; collected from May to August of several years; and many from Detroit, Michigan (Hubbard and Schwarz), October 7.

Distribution.—Introduced from Europe into Salisbury, Connecticut (1832); spread subsequently into Massachusetts and New York; recorded later from Illinois (Le Baron), Michigan (Schwarz), (see Slingerland '**92**:162); Ohio (Webster); New Jersey (Smith), (see Lintner '**93**:325); Maine (Patch '**11**:11); "southwest to Maryland and Virginia" (Sanderson—Insect Pests of Farm, Garden, and Orchard **1912**:641); California (Essig. Mon. Bul. Cal. Comm. Hort. **2**:43; 1913), the latter is doubtful.

Distribution outside of America: Great Britain, Gallia, Germany, Austria, Hungary, Transcaucasia, Akstafa (Oshanin '**07**:352); Japan (Kuwayana '**08**:163).

Food plant.—*Pyrus communis* (common pear), on which it is very destructive and of great economic importance; reported on *Pyrus malus* (apple) to a less extent in Europe, but not in America.

Life history.—*Eggs.*—The eggs are deposited about the middle of April by the females which have passed the winter in hibernation; they are light yellowish in color, ellipsoidal, with a short attachment pedicel at large end and a slender filament at small, free end; deposited singly or in rows of five to ten in cracks and creases in the bark, or in old leaf scars at the bases of the terminal buds of the preceding year's growth.

The eggs hatch in from eleven to thirty days, according to the temperature. The hibernating adults disappear about the time most of the eggs have hatched.

Nymph.—First instar.—Oval, pale, translucent yellow, abdomen darker, eyes reddish; abdomen fringed with several long hairs; wing pads not distinguishable; antennæ three-jointed; length about 0.37 mm.

Second instar.—First molt about six or seven days after hatching; size one-third larger; color practically unchanged; antennæ four-jointed; wing pads begin to appear. Second molt in four days.

Third instar.—Length 0.77 mm. Wing pads blackish and thoracic markings begin to appear; antennæ six or seven jointed. Third molt three days later.

Fourth instar.—Full-grown nymph; length 1.4 mm.; width 1.15; oval, flattened; general color light yellowish brown, marked with blackish; wing pads, distal half of abdomen, head except a mesal light stripe, several bands and spots on thoracic and basal abdominal dorsum blackish or brown; a number of long, stout, spine-like setæ project from margin of body.

After five or six days more the adult emerges, making the cycle from egg to adult about one month. There are about four broods each year (in New York), but they are not sharply separated. All stages may be found on one tree from June to September. In general, however, the greatest numbers are present at intervals of about one month. The adults emerging in September are usually the hibernating winter forms. For further details on the life history and other phases of this species, consult Slingerland **'92:** or **'96**, from which source most of the above statements have been derived.

PSYLLA HARTIGII Flor.

Figs. 130, 145.

Psylla hartigii Flor **'61:** 469.—Loew **'77:** 130; **'79:** 577; **'82:** 240; **'88:** 18.—Reuter **'81:** 150.—Scott **'82:** 253.—Edwards **'96:** 244.—Sulc **'05:** 3; **'10b:** 24; **'10c:** 26 (pl. xii).—Oshanin **'07:** 358.
Psylla hartigii (?) Patch **'12b:** 222.
Psylla sylvicola Lethierry **'74:** 90.—Scott **'76:** 539.—Douglas **'76:** 68.—Edwards **'96:** 244.

Length of body (male) 2 to 2.5 mm; (female) 2.8 to 3.2; length of forewing 3.3; width of head 0.89. General color greenish yellow to orange yellow; antennæ black distally.

Vertex rather long down the center, fully half as long as broad, emarginate in front at median line, with two foveæ discally as usual; genal cones nearly as long as vertex, rather stout, roundly acute at apex, pubescent; antennæ one and three-fifths to two times as long as width of head.

Thorax arched, typical in form. Legs rather slender; hind tibiæ with basal spur wholly wanting. Wings slightly tinged with yellow, especially in apical half, venation typical; pterostigma large.

Genitalia.—*Male.*—Anal valve long, sides subparallel, truncate at apex, pubescent; forceps much shorter than anal valve, rather slender, somewhat constricted a little beyond midpoint, terminating in a blunt, slightly bifid apex, pubescent. *Female.*—Genital segment very elongate and slender, longer than rest of abdomen, dorsal valve a little longer than ventral and conspicuously curved downward.

Described from six males and females in balsam (some of the specimens used by Miss Patch in her description **'12b:** 222), from Orono, Maine, on birch (*Betula populifolia*); these were loaned by Miss Patch. Also, several females from" Liue," Europe determined by Sulc as *P. hartigii.*

The distribution in Europe is as follows: Great Britain, Germany, Austria, Finland, Russia (Oshanin **'07:** 358). Sulc reports its host plant in Europe to be *Betula alba.*

PSYLLA AMERICANA, new species.

Figs. 101, 265, 318, 486, 487, 488.

Psylla americana Crawford '11: 628 (n. n).

Length of body 2 to 2.4 mm.; wing length 3 to 3.3; width of head 0.95 to 1.04. General color reddish brown to dark brown or blackish; vertex reddish, sometimes whitish in center; genal cones reddish at apex, paler than vertex; pronotum usually black cephalad, pale on posterior margin; præscutum whitish on posterior margin; scutum often striped with black; abdomen dark; antennæ mostly dark; wings clear, veins dark.

Vertex broad, about half as long as broad, long down median line, lobes becoming narrow on each side of front ocellus, with two foveal impressions; genal cones seldom as long as vertex, divergent, rather acutely pointed, with short pubescence. Antennæ usually about one and a half times as long as width of head, sometimes a little longer, rarely shorter.

Thorax arched rather strongly, typical in form. Legs moderately stout; hind tibiæ slightly longer than femora, with basal spur very small or wanting. Wings long, clear, transparent, rarely with a yellowish tinge, veins black and conspicuous, venation typical; pterostigma large, denser than adjacent membrane.

Genitalia.— *Male.*—Anal valve longer than forceps, of usual form, pubescent; forceps rather long and large, usually about 0.45 to 0.50 mm. long, sometimes less, broadest at base and rapidly converging to a narrow and acute apex. *Female.*—Genital segment slender, as long as rest of abdomen or longer, dorsal valve very slender in apical third and longer than ventral valve.

Described from numerous specimens of both sexes from: California: Claremont (Crawford), on *Pinus ponderosa*, June, 1911 (altitude 10,000 feet); Argus Mountains (Koebele), on *Pinus monophylla*, May, 1891; Placer and Nevada Counties (Koebele), September; Banff Springs, Alberta, Canada (Hubbard and Schwarz), June.

Type in author's collection.

PSYLLA AMERICANA MINOR, new variety.

Very similar to species in size, coloration, and general structural characters, differing as follows: Male forceps shorter and more pubescent, seldom more than 0.30 mm. long, usually about 0.20 to 0.25 mm.; anal valve proportionately shorter and broader. Female genital segment similar but usually thicker dorso-ventrally.

Described from many males and females from Colorado (C. P. Gillette), on *Salix* sp.; Boulder, Colorado (Rohwer); Berkeley, California (Crawford), on *Salix lasiolepsis*, January, 1912; Laguna Beach, California (Crawford), on same host, July, 1911; Los Angeles, California

(Koebele), on *Salix californica*, April; Fieldbrook, California (Barber), May 31, 1903. Some of these specimens bear the manuscript name of *Psylla rufula* Riley.

Type.—Cat. No. 18109 U. S. Nat. Mus

PSYLLA AMERICANA FLAVA, new variety.

Very close to the species and similar in general structural characters, but differing in color chiefly; color conspicuously lighter; dorsum with indistinct stripes or none at all; genal cones uniform in color; wings whitish, veins yellowish instead of black. The genitalia of the male resemble those of the variety *minor* of the species; the female genital segment is variable from slender to rather thick.

Described from numerous males and females from Utah: Park City, Alta and Utah Lake, collected by Hubbard and Schwarz, in June; Victoria, Vancouver, British Columbia (Hubbard and Schwarz), June; Oregon (Koebele); Santa Clara County, California (Baker); Los Angeles, California (Coquillett); Pagosa Springs, Colorado (Baker). Some of these bear the manuscript name of *Psylla americana longipennis* Crawford.

Type.—Cat. No. 18110, U. S. Nat. Mus.

PSYLLA RIBIS Patch.

Psylla ribis Patch '**12b**: 222.

Similar in size and general appearance to *americana*, and especially the variety *minor;* differing as follows: Genal cones less acute, not tipped with a darker shade than that of base; antennæ shorter than average of *americana;* wings similar; pterostigma large, yellow. Male anal valve very elongate, more than twice as long as forceps, converging a little toward apex, straight; forceps rather broad and thick, flexed forward midway, sides subparallel, apex truncate. Female genital segment similar but somewhat thicker.

Described from one male, mounted in balsam (paratype?), from Colorado (no data), and one female, in balsam, from Orono, Maine (Patch), June, 1910. Both specimens were kindly loaned to me by Miss Patch.

PSYLLA QUADRILINEATA Fitch.

Psylla quadrilineata Fitch '**51**:65.—Riley '**84**:69.—Provancher '**86**:305.—Lintner '**93**:64.

Psylla gillettei Patch '**12b**: 221.

Very closely related to *americana*, both in structure and color characters, differing as follows: Vertex different in shape, relatively broader and shorter; antennæ relatively longer, nearly twice as long as width of head. Wings with a conspicuous black spot at tip of clavus; pterostigma much smaller. Male forceps narrower at base. Female genital segment thicker dorso-ventrally.

Described from Fitch's type of *quadrilineata*, and one male and two females (paratypes of *gillettei*), from Colorado; the latter are in the Cornell University collection and were determined by Miss Patch. She states ('**12b**: 221) that some of the specimens were taken on *Salix* sp. in Colorado.

This species is apparently identical with *Psylla gillettei* Patch. Some confusion exists concerning Fitch's types of Psyllidæ. Specimens in the United States National Museum correspond closely with Fitch's descriptions and type numbers and are said to be his types. It is in accordance with this that *P. gillettei* is merged with this species.

PSYLLA ALASKENSIS Ashmead.

Fig. 413.

Psylla alaskensis ASHMEAD '10: 137.

Length of body (male) 1.8 mm.; (female) 2.8; length of forewing 3; width of head 0.87. General color greenish or brownish yellow; a spot on each side of pronotum and indistinct stripes on scutum fuscous or darker; abdomen with narrow, dark cross bands; antennæ darker on apical half or two-thirds.

Vertex about twice as broad as long, bulging forward on each side of front ocellus; with a shallow foveal impression on each side of median line posteriorly; genal cones nearly as long as vertex, subacute, divergent, pubescent; antennæ less than one and a half times as long as width of head. Wings large, hyaline, or slightly browned, venation typical; pterostigma long and large. Legs stout; hind tibiæ scarcely longer than femora, with a distinct spur at base.

Genitalia.—*Male.*—Anal valve longer than forceps, simple, typical in shape; forceps thick at base, converging to an acute point (this is according to Ashmead '**10**: fig. 9). *Female.*—Genital segment about half as long as rest of abdomen, stout; dorsal valve a little longer than ventral, less acute, with long and short setæ.

Described from one female (paratype) from Saldovia, Alaska, July 21, 1899 (T. Kincaid). Other localities: Popoff Island, Shumagin, Islands, Fox Point, all in Alaska (Harriman-Alaska Expedition, July, 1899.)

Type.—Cat. No. 6274, U. S. Nat. Mus.

PSYLLA MAGNICAUDA, new species.

Figs. 319, 489.

Length of body (male) 1.8 mm.; (female) 2.2; length of forewing 3.1; width of head 0.90. General color greenish yellow, antennæ black at tip. Body robust.

Vertex about half as long as broad, emarginate in front at median line and roundly bulging on each side, with two rather shallow foveal impressions; genal cones long, at least as long as vertex, usually longer, slender, moderately divergent, rather acute at apex, pubescent. Antennæ nearly twice as long as width of head.

Thorax well arched. Legs stout; hind tibiæ with a distinct basal spur. Wings slightly tinged with yellow, venation and shape typical; pterostigma small and narrow.

Genitalia.—Male.—Anal valve long, sides subparallel, pubescent; forceps elongate, slender, strongly bowed, reaching nearly to tip of anal valve, acutely pointed. *Female.*—Genital segment unusually large and thick, as long as rest of abdomen, dorsal valve a little longer than ventral.

Described from several males and females from Sheridan, Wyoming (C. W. Metz), August, 1910; Arboles, Colorado (C. F. Baker). These bear the manuscript name of *Psylla americana abdominalis* Crawford.

Type in author's collection.

PSYLLA STRIATA Patch.

Psylla striata PATCH '11:14.

Length of body (male) 1.9 mm.; (female) 2.3; length of forewing 2.7; width of head 0.82. General color greenish yellow, antennæ black or brown on apical third.

Close to *carpinicola*, differing chiefly in antennæ and genal cones; antennæ distinctly shorter, not over twice as long as width of head, often less and relatively thicker; genal cones shorter; body somewhat smaller; wings more flavous; pterostigma moderately broad at base. Male genitalia similar to *carpinicola;* female genital segment relatively a little shorter.

Described from one female (paratype), from Orono, Maine (Patch), on birch (*Betula* sp) June 25, 1910; two from Portland Maine (E. P. Van Duzee), 7-7-'09; several of both sexes from Holderness, New Hampshire (Koebele), on birch, October 2, 1884; several from Polk County, Wisconsin (Baker). Several specimens from Colorado seem to belong to this species, but this is not certain. Several others from Marin County, California, seem to be a varietal form of the species, collected by A. Koebele on *Corylus rostrata*, August 11, 1885; these bear the manuscript name of "*Psylla coryli* n. sp." but are wholly distinct from *P. coryli* Patch.

Miss Patch seems to have identified with her *striata* a number of specimens of a closely related but distinct species from New York State. These have been referred to the species *cephalica*.

The nymphs live on the terminal leaves and shoots of *Betula*, and cover themselves with inconspicuous woolly masses. The mature forms emerge late in June (Patch '11: 14).

PSYLLA CARPINICOLA, new name.

Figs. 86, 91, 262, 317, 473, 478.

Psylla carpini Fitch '51:—Riley '83: 69.—Lintner '93: 64.

Length of body (male) 2.1 mm.; (female) 2.7 to 3; length of fore wing 3; width of head 0.87. General color greenish yellow, antennæ black at tips and on apices of four terminal segments.

Head broad; vertex usually not deeply impressed discally, nearly half as long as broad, emarginate in front at median line; genal cones as long as vertex or often longer, acute to subacute at apex, moderately divergent, pubescent, scarcely deflexed from plane of vertex. Antennæ long and slender, fully two and a half times as long as width of head.

Thorax typical in form. Hind tibiæ with a distinct spur at base. Wings rather clear, sometimes slightly yellow but never so much as in *striata*, venation similar to that of *striata*.

Genitalia.—*Male.*—Anal valve long, narrowed apically, tip broadened somewhat, densely pubescent; forceps long, slightly narrowed midway, with a black tooth at apex. *Female.*—Genital segment longer than rest of abdomen, moderately thick at base and converging to an acute apex; dorsal valve longer than ventral.

Described from several males and females from Polk County, Wisconsin (Baker); Ames, Iowa (Mally), July 1, 1894; Ormsby County, Nevada (Baker). Several of these specimens have been identified as *P. carpini* by C. V. Riley and others, though how authentic this is, is not certain.

Förster, in 1848, named a European species *carpini*. Although this is a synonym of *Psylla mali*, yet it invalidates Fitch's *carpini* which was described in 1851. In order not to change the name too much, since it is so familiar, I have assigned to it the name *carpinicola*.

PSYLLA CEPHALICA, new species.

Figs. 90, 263, 309, 475.

Closely related to *carpinicola*, but a little larger and broader; head distinctly broader, sometimes about 1 mm broad; vertex flatter; genal cones larger, broadly rounded and only a little divergent, about as long as vertex or shorter; antennæ equally long and slender. Legs rather stout. Wings more yellow than in *carpinicola* but less than in *striata;* long branch of cubitus (Cu_1) distinctly more arched than in either of the above species.

Described from several males and females from Texarkana, Arkansas (R. A. Cushman) on *Carpinus caroliniana*, March 20, 1907; Marshall, Texas (Cushman), on *Rubus*, March, 1907; Washington, District of Columbia (Schwarz), August; Mud Creek, Tompkins County, New York, in June, 1904 (determined by Miss Patch as

Psylla striata Patch), Polk County, Wisconsin (Baker). The northern specimens are smaller than the southern forms and come closer to *carpinicola.*

Type in author's collection.

PSYLLA ANNULATA Fitch.

Figs. 77, 80, 258, 301, 466.

Psylla annulata FITCH '51: 64.—ASHMEAD '81: 222.—RILEY '83: 70.—LINTNER '93: 64.—RILEY (in Lintner '93: 411.—MALLY '94: 153.—PATCH '12b: 220.

Length of body (male) 2.1 mm.; (female) 2.7; length of forewing 3.8; width of head 1.08. General color straw-yellow; antennæ straw-yellow, annulated with black on basal half.

Head relatively very broad; vertex not half as long as broad, with a more or less conspicuously constricted annular, stalk-like area between base or inner margin of eye and elevated portion of vertex and posterior ocellus; genal cones longer than vertex, divergent, acute to subacute, pubescent. Antennæ long, about two and a half times as long as width of head, not as slender as in *carpinicola.* Legs rather stout; hind tibiæ with a large spur at base; wings large, clear, or slightly yellowish; pterostigma large.

Genitalia.—*Male.*—Genitalia similar to *carpinicola. Female.*—Genital segment much shorter than in that species, not as long as rest of abdomen, dorsal valve a little longer than ventral.

Described from one pair from Ames, Iowa (Mally), which seems to fit very well Fitch's brief description. Miss Patch ('12b: 219) states that the species is abundant at Middletown, Connecticut, on Rock Maple, *Acer saccharum* Marsh. Fitch stated that the species occurs on maple, so that it seems very probable that this is his species. The black annulation of the antennæ seems to be very constant, and this, together with the fact that it seems to be restricted to the maple, probably indicates that it is a species distinct from the very closely related *negundinis* of Mally.

PSYLLA NEGUNDINIS Mally.

Psylla negundinis MALLY '94: 155.—PATCH '12b: 220.

Exceedingly close to *annulata,* differing chiefly in antennal coloration and in food-plant. Antennæ without black annulation, straw-yellow, except terminal joint black. Food-plant.—*Negundo* sp. (box elder). Were it not for the constant, though slight, difference in color and the difference in food-plants, I should not hesitate to make this species synonymous with *annulata,* as perhaps it is.

Described from several males and females from Ames, Iowa (C. W. Mally), on box elder, August 16, 1894 (determined by Mally); Polk County, Wisconsin (Baker); Colorado (Gillette), no data; several in the National Museum collection with only the data "3658, June 20, '85."

PSYLLA BREVISTIGMATA Patch.

Figs. 92, 93, 264, 308, 484.

Psylla brevistigmata Patch '12b: 222.

Length of body (male) 1.6 mm.; (female) 2.1; length of forewing 2.3 to 2.5; width of head 0.85. General color light reddish brown to red, with more or less conspicuous white markings and stripes; vertex with border more or less continuously white, or at least front margin white; genal cones white on basal half, red distally; pronotum white on posterior half; præscutum bordered with white on hind margin; scutum with longitudinal white or pale stripes; pleuræ and abdomen more or less variegated. These colors may sometimes be more indistinct.

Vertex broadly crescentic, front margin evenly rounded, emarginate at median line, somewhat bulging on each side of front ocellus, with a shallow depression discally on each side. Genal cones thick at base, shorter than vertex, strongly divergent, roundly acute at apex, pubescent. Antennæ about two and three fourths times as long as width of head, slender, black apically.

Thorax rather strongly arched, broad. Hind tibiæ, slender, longer than femora, with a small spur at base behind. Wings about two and a half times as long as broad, hyaline, slightly yellowish along veins in distal third or half; pterostigma broad at base but short, less than half as long as Rs.

Genitalia.—*Male.*—Anal valve slightly longer than forceps, simple, broad from posterior view; forceps acute at tip, arched toward each other rather strongly, sides subparallel, pubescent. *Female.*—Genital segment not as long as rest of abdomen, dorsal valve a little longer than ventral and less acute at apex, with a number of short, thick setæ at tip.

Described from two females (paratypes) from Alta Meadows, Sequoia National Park, California (9,000 feet), July 19, 1907 (J. C. Bradley); these paratypes are in the collection of Cornell University, Department of Entomology; one male from California (no data), which bears the manuscript name of *Psylla albirufa* Crawford; one male from Santa Clara County, California (Koebele), September, 1885, on *Cercocarpus parviflorus* Nuttall; six from Los Angeles, California (Koebele), April; several from Santa Cruz Mountains, California (Koebele); these differ slightly in the male forceps and may be a varietal form; Siskiyou County, California (Koebele); Colorado (no data).

Whether or not certain variations in the male genitalia in these forms indicate distinct species, it is difficult to say. For the present, at least, these will be called merely varietal forms of the one species. In size and coloration of body also there seems to be considerable variation, but this is due probably to differences in local environment.

PSYLLA BREVISTIGMATA MAGNA, new variety.

Similar to the species, except in the male forceps, which are longer and diagonally truncate at the apex.

Several males and females from Utah; one from Ormsby County, Nevada (Baker).

Type.—Cat. No. 18111, U. S. Nat. Mus.

PSYLLA BREVISTIGMATA ACUTA, new variety.

Close to the species, but differing in the male forceps, which are more slender, more acuminate, and are turned forward in distal third, terminating in a blunt apex.

Several males and females from the mountains near Claremont, California (Crawford), on foliage of *Pinus ponderosa,* elevation 10,000 feet, July, 1911; Wasatch Mountains, Utah (Koebele), on *Cercocarpus ledifolius,* June 20, 1885.

Type.—Cat. No. 18112, U. S. Nat. Mus.

PSYLLA FLOCCOSA Patch.

Figs. 82, 142, 251, 302, 467.

Psylla floccosa PATCH '09: 301; '10: 29; '11: 11.

Length of body (male) 2.1 mm; (female) 3.8; length of forewing 4.8; width of head 0.98 to 1.05. General color greenish yellow, sometimes with a brownish tinge; distal antennal segments black.

Vertex not half as long as broad, with two shallow foveæ, front ocellus rather sunken in emargination at median line. Genal cones longer than vertex, not strongly divergent, large, subacute or narrowly rounded at apex, sometimes densely pubescent. Antennæ not quite three times as long as width of head, slender.

Thorax strongly arched, coarsely punctate. Pronotum long. Legs moderately large; hind tibiæ slightly longer than femora, basal spur small or almost wanting; apical spines conspicuous, seven or eight in number. Wings very large, broad at apex, transparent; venation typical; pterostigma almost or wholly wanting; veins flavous.

Genitalia.—*Male.*—Anal valve long, converging toward tip, pubescent; forceps long, rather slender, converging in distal portion to a simple, acute, black point. *Female.*—Genital segment as long as rest of abdomen or longer, somewhat subglobose in basal fourth or fifth, thence abruptly narrowed and slender, styliform, dorsal valve slightly upturned at tip, a little longer than ventral.

Described from one female (metatype) from Orono, Maine (Patch), July 6, 1909, on *Alnus incana* Willdenow; Lake Temagami, Ontario, Canada, August 12, 1906 (W. J. Palmer;) Oakland, Maryland (Hubbard and Schwarz), July 9; Toland, Colorado (Cockerell), on *Alnus tenuifolia,* August, 1911; Placer County, California (Koebele), on *Alnus incana,* September. Some of these bear the manuscript name of *Psylla styliformis* Crawford.

Nymph.—Adult nymphs are oval in shape, flattened, about 3.19 mm in length more or less; head and thorax pale green, abdomen pale yellow; eyes bright pink; tips of antennæ, legs, and beak dusky; densely covered with a white, flocculent fluffy mass, appearing, as Miss Patch very aptly described them, as "walking ostrich plumes."

"The eggs are probably deposited upon the alder in the fall, as the newly-hatched psyllids appear about the time the alder leaves are unfolding in the spring, and settle upon the ventral surface of the leaves" (Patch **'10**: 301). Adults emerge about the middle or latter part of June, in Maine.

PSYLLA ASTIGMATA, new species.

Figs. 87, 256, 257, 311, 471.

Length of body (male) 2.3 mm; (female) 3; length of forewing 4.8; width of head 0.95. General color yellowish green throughout, antennæ brown or black except three basal joints.

Vertex not half as long as broad, roundly concave between elevated posterior ocelli; genal cones about as long as vertex, divergent, rather acute to subacute at apex, pubescent. Antennæ nearly three times as long as width of head.

Thorax typical. Legs long; hind tibiæ a little longer than femora, with basal spur small or almost wanting. Wings very large, clear; venation typical; pterostigma small or wanting.

Genitalia.—*Male.*—Anal valve similar in form to that of *floccosa;* forceps broad, black at apex, with apical margin distinctly emarginate or bifid; the degree of this emargination varies; anterior subapical margin sometimes roundly emarginate, making a long median tooth. *Female.*—Genital segment short and thick, not as long as rest of abdomen, nearly or fully half as thick dorso-ventrally as long; dorsal valve a little longer than ventral.

Described from several males and females from Polk County, Wisconsin (Baker); Manitou, Colorado (Gillette); September; Placer County, California (Koebele), on *Prunus demissa,* October; Sisson, California (J. C. Bradley), August 19, 1908; Easton, Washington (Koebele).

Type in author's collection.

PSYLLA TRIMACULATA Crawford.

Psylla alni trimaculata CRAWFORD **'11c**: 631.

Very close to *astigmata,* and perhaps not specifically distinct; differs chiefly in having three large and very prominent red spots on thoracic dorsum, one on anterior half of praescutum, and one on each side of scutum. Genal cones more acutely pointed.

Described from two females, one from Gowanda, New York (E. P. Van Duzee), August 2, 1907, and one from Lake Placid, New York, August 15, 1896 (C. S. Sheldon).

Type in author's collection.

PSYLLA CERASI Patch.

Psylla cerasi PATCH '12b: 223.

Very close to *astigmata*, differing chiefly in being very strikingly red to vermillion in color instead of greenish; "head and thorax rosy, dorsal abdomen almost vermillion, a black spot on dorsum of first abdominal segment, five vivid transverse black bands across abdominal dorsum, the last coming just cephalad the genital segment. Antennal joints I to III rosy, rest black: eyes bright black: wings clear and a little brownish, ventral body pale.". (Patch '12b: 233.) The one paratype (♀) which Miss Patch has kindly loaned to me does not show these color characters, since it has been mounted in balsam. Vertex and genal cones resembling more closely *astigmata* than *trimaculata*. Wings very large; medial vein closer to radial sector than in *astigmata*.

Described from one female (paratype ♀), in balsam, from Stillwater, Maine (Patch), on wild cherry (*Prunus cerasus* ?), September 14, 1911. The eggs, supposedly of this species, were found on the same date between the leaf buds and twigs.

More biological data or more extensive collections will be necessary before the true relationships of this and the two preceding species can be ascertained. It is possible that all three will prove to be but variations of one species.

PSYLLA ALNI AMERICANA, new variety.

Figs. 4, 10, 11, 15, 85, 89, 260, 307, 310, 477.

Length of body (male) 3 mm.; (female) 3.8; length of forewing 4.3; width of head 1.08. General color yellowish green, antennæ black or brown distally.

Similar to *floccosa* but vertex relatively shorter, only about one-third as long as broad, as long as pronotum; genal cones short, about as long as vertex or often distinctly shorter, broadly rounded at apex or sometimes broadly subacute, pubescent. Antennæ nearly or fully three times as long as width of head. Basal spur of hind tibiæ usually large and conspicuous. Wings typical in form and venation; pterostigma large, sometimes moderately narrow; wings clear, sometimes slightly flavous.

Genitalia.—*Male.*—Anal valve long, converging to a narrow apex; forceps long, narrow, broadened in apical third or fourth (from side view), apex truncate, either straight or slightly emarginate on truncate margin. *Female.*—Genital segment slender, usually longer than rest of abdomen, dorsal valve longer than ventral.

Described from several hundred specimens of both sexes from: Claremont, California (Crawford), July, 1911, on *Alnus rhombifolia;* Stanford University, California (Crawford), on same host, September, 1911, and May, 1912; Visalia, California (J. C. Culbertson); Ormsby

County, Nevada (C. F. Baker). Some of these bear the manuscript name of *Psylla alni gossypiona* Crawford, having been separated from the variety *americana* on too slight differences.

Type in author's collection.

Nymphs.—Abundant on the lower surface of the alder leaves in summer and fall, conspicuous because of the dense white flocculent substance with which they cover themselves, as described for *floccosa;* length 1.8 to 2.5 mm. Color pale brownish, or often brown; caudal half of abdomen darker, with dark cross-bands on basal half.

PSYLLA CAUDATA, new species.

Figs. 88, 259, 305, 472.

Length of body (male) 2.2 mm.; (female) 4.1; genital segment of female 1.9; length of forewing 4.3; width of head 0.98. General color brown to blackish; dorsum of head and thorax with irregular pale stripes, bands, or spots; antennæ and legs brown to fuscous; abdomen mostly blackish.

Vertex less than half as long as broad, relatively a little longer than in preceding species, less concave; genal cones large, as long as vertex, rounded at apex or often subacute, pubescent. Antennæ over two and a half times as long as width of head.

Thorax strongly arched. Hind tibiæ with large basal spur. Wings clear, transparent; veins black and prominent, venation typical; pterostigma moderately large.

Genitalia.—Male.—Anal valve not much longer than forceps, abruptly narrowed just before apex; forceps moderately long, somewhat enlarged at apex, apex truncate and bifid or rather deeply emarginate, as in *astigmata. Female.*—Genital segment extremely long, nearly as long as rest of body, very slender, acuminate and curved upward in caudal third or half, very acute at apex, dorsal valve longer than ventral; with an apparent suture across both valves near the center.

Described from several males and females from Tolland, Colorado (Cockerell), on *Alnus tenuifolia,* August, 1911; Pagosa Springs, Colorado (Baker); several others with data "Colo," and no more.

Type in author's collection.

PSYLLA GALEAFORMIS Patch.

Fig. 144.

Psylla galeaformis PATCH '11:12.

Length of body (male) 2.2 mm.; (female) 3.8; genital segment of female 1.3; length of forewing 4.2; width of head 0.96. General color orange to reddish brown, sometimes rather dark; paler ventrad; thorax with paler markings, somewhat as in *caudata,* but less conspicuous.

Similar to *caudata* in most respects. but [illegible] usually more acute; antennæ nearly three tim[illegible] head; hind tibiæ with a moderately large spur at base. Wings similar but often tinged with yellow. Male anal valve and forceps longer than in *caudata;* forceps more slender and less enlarged at apex. Female genital segment less elongate, relatively thicker and not upcurved at apex, less than one-third as long as rest of body, without an apparent suture across the middle.

Described from one female (paratype) from Orono, Maine (Patch), on *Alnus incana,* July 26, 1905; several males and females from Stamford, New York (Van Duzee), June 6, 1909; Holderness, New Hampshire (Koebele), October, 1884; Ottawa, Ontario, Canada (W. Metcalfe), on "Alder," August 3, 1904; Marquette, Michigan (Hubbard and Schwarz), July 27; Easton, Washington (Koebele).

PSYLLA TORRIDA, new species.

Figs. 96, 269, 312, 474.

Length of body (male) 1.6 mm.; (female) 2.1; length of forewing 2.3; width of head 0.70. General color orange to red; abdomen blackish ventrad; antennæ black on apical three-fourths.

Head scarcely as broad as thorax; vertex elevated roundly (when viewed from directly above it) in front on each side of median line, postocellar areas strongly elevated, somewhat pubescent. Genal cones about two-thirds as long as vertex, more or less separated at base and quite strongly divergent, rounded to subacute at apex, with a few long blackish hairs. Antennæ extremely long and slender, more than four times as long as width of head.

Thorax rather strongly arched, somewhat pubescent. Hind tibiæ with a relatively large spur at base. Wings small, less than twice as long as broad, rather squarish on apical margin, clear or slightly tinged with yellow; costal margin distinctly setose; pterostigma small, opaque-yellow.

Genitalia.—Male.—Anal valve small, rather cylindrical, not much longer than forceps, somewhat flared out cup-like at apex; forceps ovoid, flattened, about twice as long as broad (in lateral aspect), pubescent; with a slender, crotch-shaped structure arising between forceps from caudal end of genital segment, and the two slender capitate arms lying close to the inner surface of forceps. *Female.*—Genital segment nearly as long as rest of abdomen, dorsal valve longer than ventral and less acute; ventral valve very acute at tip; pubescence long and stiff.

Described from four males and five females from Para, Brazil (C. F. Baker). This and the following two species, all tropical, are sharply distinguished by the extremely long antennæ, and are closely interrelated in many respects, and it is quite possible that they should be placed in a distinct genus.

Type in author's collection.

PSYLLA ORIZABENSIS, new species.

Figs. 95, 479.

Closely related to *torrida*, differing as follows: Larger; body (female) 2.6 mm. long; forewing 3; head relatively a little broader. Vertex less emarginate in front at median line. Wings longer, over two and a fourth times as long as broad, rounded at apex, yellowish, venation similar, but pterostigma distinctly larger. Female genital segment a little longer.

Described from one female from Orizaba, Mexico (Crawford), August 20, 1910.

Type in author's collection.

PSYLLA MINUTICONA, new species.

Figs. 94, 480.

Length of body (male) 1.7 mm.; (female) 2.1; length of forewing 2.2; width of head 0.68. General color greenish yellow to light orange; antennæ flavous on basal half, rest black.

Resembling *torrida*, but smaller ; vertex almost straight across front margin, rounded down from base toward genal cones almost as in *Calophya;* genal cones very short and rounded, not as long as their width at base, with a few rather long hairs; antennæ as in *torrida*. Wings about twice as long as broad, clear or slightly yellowed, broadly rounded at apex, venation similar; pterostigma small, as in *torrida*.

Genitalia.—Male.—Anal valve similar to *torrida;* forceps of same type, flat-ovoid, about two-thirds as broad as long, with a similar crotch-shaped structure between them. *Female.*—Genital segment similar, but shorter.

Described from one male and two females from Champerico, Guatemala (C. F. Baker).

Type in author's collection.

DOUBTFUL SPECIES.

PSYLLA RECTICEPS Provancher.

Psylla recticeps PROVANCHER '86: 305.

This seems to be a species of *Aphalara*, and were it not for the fact that the wing is described as acute, I would have no hesitation in assigning it to that genus. The description of the wings suggests *Trioza*. In his key to the genera, Provancher describes *Psylla* as "head square in front, anterior margin slightly emarginate; antennæ nearly as long as body;" this is apparently *Aphalara*. *Diraphia* is described as "head cleft in front, forming on each side a conical projection"—apparently *Psylla*.

It was described by Provancher as follows:

Psylla recticeps n. sp.—Length 0.12 inch; color greenish yellow; head short, t verse, emarginate in front, with a median impressed line and a depression or side of it; ocelli light red, two near posterior margin of eyes, third in anterior emargination. Eyes green or brown, large, prominent; antennæ long, slender, two basal joints longest, II longer than I; terminal joint a little thickened, with two setæ. Rostrum 3-jointed, large, tip black. Prothorax short, rounded on front margins; mesonotum large, transverse. Wings transparent, yellowish, veins rather prominent; median vein forming a cell at the acute apex of the wing, enlarged at base and flexed above. Venter and legs concolorous; abdominal segments margined with red. Common on bushes. Cape Rouge, Isle de la Madelaine.

DIRAPHIA QUADRICORNIS Provancher.

Diraphia quadricornis PROVANCHER '86: 306.

This appears to be identical with *Psylla galeaformis* Patch, but because of the uncertainty I am unwilling to refer the latter to this name.

According to Provancher it was described as follows:

Length 0.20 inch; color green with orange tinge; cephalic cones, legs, and antennæ slightly lighter; antennæ green at base, then lighter, black at tip, almost as long as body. Wings entirely hyaline, veins prominent. Metacoxal spurs large, acute. Female abdomen large, stout, brownish at extremity.

Cape Rouge, Ottawa. Common.

DIRAPHIA SANGUINEA Provancher.

Diraphia sanguinea PROVANCHER '86: 307.

This suggests *Psylla cerasi* Patch, and is perhaps identical with it.

It was described by Provancher as follows:

Length 0.13 inch; color reddish to black; three lobes of mesonotum blood-red; tip of rostrum, abdominal segment margins and tarsal spines black. Head pale beneath, red above. Wings hyaline, triangular terminal cell very long and narrow. Abdomen striped red and black. Genital segment long, pointed, conical.

Cape Rouge.

PSYLLA DUVAUÆ Scott.

Psylla duvauæ SCOTT '821: 443.—JHERING '85: 129.

A South American species.

PSYLLA, sp. (?)

A few apparently new species are not sufficiently represented in the collection to be described as new, but illustrations of them are included herewith, in figs. 81, 97, 303, 313, 469, 481.

EUROPEAN SPECIES.

For the sake of comparison, several European species have been illustrated in the plates, but no description is given in the text:

Livia juncorum Latreille (figs. 22, 23, 218, 271, 427); *Euphyllura phillyreae* Forster (figs. 35, 224, 274, 430); *Euphyllura olivina* Costa (figs. 223, 429); *Floria spectabilis* Flor (figs. 44, 226, 435); *Floria radiata* Forster (Alloeoneura) (figs. 45, 277, 437); *Aphalaroida ericae* Curtis (Rhinocola) (figs. 55, 291, 460); *Aphalaroida succincta* Heeger (Rhinocola) (figs. 54, 238, 459); *Amblyrhina cognata* Loew (figs. 71, 72, 247, 457); *Psyllopsis fraxini* Linnaeus (figs. 231, 282, 440); *Psylla crataegi* Forster (fig. 320); *Psylla alni* Linnaeus (fig. 476); *Psylla pyri* Linnaeus (fig. 395).

BIBLIOGRAPHY.

Aleman '87.—La Naturaleza (Mexico City), 1887: 21–26, pl. 3. (*Freysuila.*)

Andre, Edm. '78.—Life history of *Trioza centranthi* Vall., Ann. Soc. Ent. France, 1878:77–86.

Ashmead, Wm. H. '81.—The Aphidæ (Psyllidæ) of Florida. Can. Ent., 13: 220–225, 1881.

'10.—Homoptera of Harriman-Alaska Series, vol. 7: 135–137, 1910.

Aulmann, G. '11.—Schädlinge an Kulturpflanzen aus deutschen Kolonien. Mitth. Zool. Mus. Berlin, 5: 261–273, 1911.

'12.—Beiträge zur Kenntniss der Afrikanische Chermiden- (Psylliden-) Fauna, pts. i-v, Ent. Rundschau, 29: 10–12, 19–21, 35–36, 100–101, 117–118, 123–125, 1912.

'13.—Psyllidarum Catalogus, W. Junk, Berlin, 1913: 1–92.

Barnard, '79.—Psylla pyrisuga (Pear tree psylla). Proc. Amer. Ass. Adv. Sci., 28: 478, 1879.

Beutenmüller, Wm. '92.—Catalog of Gall-Producing Insects found within fifty miles of New York City. Journ. Amer. Mus. Nat. Hist., 4: 245–268, 1902.

'94.—Insect Galls of the Vicinity of New York City. Journ. Amer. Mus. Nat. Hist., 4: No. 4, 1904.

Bohlin, Knut '01.—Två Zoocecider på Laurus canariensis. Ent. Tidskrift, 22: 89–91, 1901. (*Trioza alacris.*)

Börner, Carl. '10.—Die Flügeladerung der Aphidina und Psyllina. Zool. Anzeiger, 36: 16–24, 1910.

Boyer, M. '40.—Insects Which Attack the Olive Tree. Ann. Ent. Soc. France, 1840: 111–112.

Buckton, G. B. '93*a*.—The Mango Psylla. Indian Museum Notes, 3: 13–14, 1893.

'93*b*.—The Mango-Shoot Psylla. Indian Museum Notes, 3: 91–92, 1893.

'94.—Notes on a New Psyllid. Indian Museum Notes, 3 (No. 5): 18–19, 1894.

'00.—Description of New Species of a Psylla Destructive to Forest Trees. Indian Museum Notes, 5: 35–36, 1900.

Cockerell, T. D. A. '10.—A New Gall-Making Psyllid. Ent. News, 21: 180–181.

'11.—Fossil Insects from Florrisant, Colorado. American Museum of Natural History, 30: 75–76, 1911.

Cook, M. T. '04.—Insect Galls of Indiana. Indiana, Dep. Geology and Natural Resources, 29th Report, 1904: 888–901 (Psyllidæ, 844–845).

Costa, A. '57.—Psilla dell' Olivo (*Psylla olivina*). Insetti Novici All' Agricultura, 35–42, pl. 2*a*, B, 1857.

Crawford, D. L. '10*a*.—American Psyllidæ I (Triozinæ). Pomona Journal Entomology, 2: 228–237, 1910.

'10*b*.—American Psyllidæ II (Triozinæ). Pomona Journ. Ent., 2: 347–362, 1910.

'11*a*.—American Psyllidæ III (Triozinæ). Pomona Journ. Ent., 3: 422–453, 1911.

'11*b*.—American Psyllidæ IV (Partial Revision of Subfamilies). Pomona Journ. Ent., 3: 480–503, 1911.

'11*c*.—American Psyllidæ V. Pomona Journ. Ent., 3: 628–632, 1911.

'12*a*.—Trioza alacris Flor.—A New Pest in California. Bulletin California State Commission Horticulture, 1: 86–87, 1912.

'12*b*.—A Note on Certain Psyllidæ. Pomona Journ. Ent., 4: ——, 1912.

'12*c*.—Indian Psyllidæ. Records of the Indian Museum, 7: 419–437, 1912.

'13*a*.—New genera and species of Psyllidæ from the Philippine Islands. Philippine Journal of Science. 8 (Sec. D): 293–301, 1913.

'14.—A newly described Psyllid from East Africa (Hemip.). Entomological News, 25: 62–65, 1914.

Curtis, John '35.—British Entomology 1835: No. 565 (2 pages and 1 color plate).

'42.—The Pear Tree Psylla. Gardeners' Chronicle, 1842: 156.

Dahlbom, A. G. '51.—Anmärkninger öfver Insekter som blifvit funne på Gottland och i en del af Calmare län. Vet. Akad. Handl., 1851: 177.

Dickel, Otto '05.—Bisherige Veranderungen der Fauna Mitteleuropas durch Einwanderung und Verbreitung Schädlicher Insekten. Zeitschr. f. Wiss. Ins. Biol., 1: 402, 1905.

Dobeneck, von '95.—Ein Unbekannter Rhynchote auf Sinapis alba. Zeitschr. Pflanzenkr., 5: 324–326, 1895. (Apparently a psyllid larva.)

Douglas, J. W. '76*a*.—Notes on Some Species of Psyllidæ. Ent. Month. Mag., 13: 40–42, 1876.

'76*b*.—Notes on Some Species of Psyllidæ (2). Ent. Month. Mag., 13: 67–68, 1876.

'78*a*.—The Scandinavian Psyllidæ. Ent. Month. Mag., 15: 41–42, 1878.

'78*b*.—The Natural History of *Psylla succincta*. Ent. Month. Mag., 15: 68–69, 1878.

'78*c*.—Note on *Trioza galii* Frst. Ent. Month. Mag., 15: 92–93, 1878.

'79.—Notes on Some Species of British Hemiptera. Ent. Month. Mag., 15: 255, 1879.

Duda, L. '92.—Catalogus Insectorum Faunæ Bohemicæ Rhyncota.—Heteroptera, Cicadina, Psyllina. Ges. f. Physiokratie, Bohmen, 1892: 37–39.

Edwards, J. '90.—Catalog of British Hemiptera (Homoptera), 1890: 15–16. (A bare list, with no references.)

'96.—Hemiptera-Homoptera of the British Isles.—Psyllidæ: 224–261 and pls. 26–28, 1896.

'08.—Some British Homoptera Hitherto Undescribed or Unrecorded. Ent. Month. Mag., 44: 85–87, 1908.

Enderlein, G. '10*a*.—*Panisopelma quadrigibbiceps*, Eine neue Psyllidengattung aus Argentinien. Zool. Anzeiger, 36: 280–281, 1910.

'10*b*.—Wissen. Ergebnisse der Exped. dem Kilimandjara, etc., Hemiptera (Psylliden). Kön. Schwedischen Akad. Wiss., 12(8): 137–144, 1910.

Essig, E. O. '13.—Injurious and Beneficial Insects of California. Month. Bul. California State Commission Horticulture, 2: 43–44, 1913 (pear psylla in California).

Felt, E. P. '11.—The Ash Psylla (*Psyllopsis fraxinicola* Frst). New York State Entomologist, 26th Report; in New York State Museum Bull. 147: 39–40, 1911.

Fitch, Asa '51.—Catalog, with References and Descriptions of the Insects Collected and Arranged for the State Cabinet of Natural History, 1851: 64. (Reprinted in Lintner '93.)

'57.—Fourth Report New York State Entomologist, 1857: 740.

Fletcher, J. '83.—Note on the Occurrence of *Pachypsylla* in Cowansville, Canada, near Ottawa. Canadian Entomologist, 15: 40, 1883.

Flor, G. '60.—Die Rhynchoten Livlands in Systematischer Folge Beschreiben (1) Rhynchota frontirostria Zett., 1860: 479.

'61.—Zur Kenntniss der Rhynchoten Beschreibung neuer Arten der Familie Psyllodea Burm., Moskau, 1861.

Förster, Arn. '48.—Uebersicht der Gattungen und Arten in der Familie der Psylloden. Verh. d. Nat. Vereins d. Preussischen Rheinlande, 1848: 67–98.

Forbes, S. A. '85.—The Yellow Jumping Pear Louse. Illinois State Entomologist's 14th Report, 1885: 98–100. (*Trioza pyrifoliæ*)

Frauenfeld, G. R. '61.—Beitrag zur Kenntniss der Insekten-Metamorphose. Verh. Zool. Bot. Ges. Wien, 11: 163–174, 1861.

'64.—Zoologische Miscellen III. Verh. Zool. Bot. Ges. Wien, 14: 681–696, 1864.

'70.—Metamorphoses of Injurious Insects. Verh. Zool. Bot. Ges. Wien, 20: 662, 1870.

Froggatt, W. W. '98.—The Growth of Vegetable Galls (Psyllidæ). Agricultural Gazette of New South Wales, 9: 488, 1898.

Froggatt, W. W. '00.—Australian Psyllidæ I. Proc. Linn. Soc. N. S. Wales, 1900: 250–302.

'01.—Australian Psyllidæ II. Proc. Linn. Soc. N. S. Wales, 1901: 242–298.

'02.—Insects of the Wattle Trees (Psyllidæ et al.). Agr. Gaz. N. S. Wales, 13: 718, 1902.

'03.—Australian Psyllidæ III. Proc. Linn. Soc. N. S. Wales, 1903: 315–337.

'05.—The Insects of the Kurrajong. Agr. Gaz. N. S. Wales, 16: 231–232, 1905.

'07.—Psyllidæ, Lerp-Insects. Australian Insects, 1907: 361–367.

Fuller, A. S. '80.—*Psylla rubi* (*Trioza tripunctata*). Amer. Ent., 3: 62, 1880.

Fyles, T. W. '83*a*.—The Gall Insect of the Nettle Tree. Can. Ent., 15: 83–84, 1883.

'83*b*.—Further Notes on the Psyllidæ. Can. Ent., 15: 198–200, 1883.

Geoffroy, M. 1762.—Histoire Abrégée des Insectes, 1: 482–489, 1762. (*Psylla*)

Giard, A. '02.—A Psyllid Gall on *Rhamnus alaternus* erroneously attributed to a Coccid. Bull. Ent. Soc. France, 1902: 121–122.

Gillette, C. P., and Baker, C. F. '95.—A Preliminary List of the Hemiptera of Colorado. Colorado (Fort Collins) Agr. Exp. Station Bull. 31: 113–115, 1895.

Glover, T. '77.—*Calophya rhois*. Agricultural Report for 1876, 1877: 33. (see Riley '84: 69).

Hacker, P. L. '00.—A Note on *Psylla pyrisuga*. Illustr. Zeit. Ent., 5: 219, 1900.

Harris, '52.—Injurious Insects, 1852: 201. (Early history of *Psylla pyri* in U. S.)

Hartig, '41.—Germar Zeitschrift für der Entomologie, 3: 375, 1841.

Horvath, G. '97.—Homoptera Nova ex Hungaria. Termeszetrajzi Fuzettek, 20: 638–643, 1897.

'08.—Ann. Nat. Mus. Hung., 6: 568–569, 1908. (*Psylla borealis* in Greenland).

Houard, C. '08–09.—Les Zoocecides des Plantes d'Europe I–II, 1908–1909 (page references too numerous to cite in detail.)

Jarvis, '06—Entomological Society of Ontario (Canada), 37th Annual Report, p. 65, 1906.

Jhering, H. '85.—Gall Insects of Southern Brazil. Ent. Nachricht., 11: 129–130, 1885.

Johnson, S. A. '11.—News Notes—The Tomato Psyllid. (see Patch '12*b* : 232).

Kieffer, J. J. '89.—Mittheilung über Psylliden. Ent. Nachricht., 15: 222–224, 1889.

'93.—Galls Collected in Lothringens. Ent. Nachricht., 19: 22, 1893.

'98.—Description of a Coccid Producing Galls on *Rhamnus alaternus* and *oleoides*. Bull. Ent. Soc. France, 1898: 214–215.

'05.—Etude sur de nouveaux Insectes et Phytoptides gallicoles du Bengale. Ann. Soc. Sci. Bruxelles, 29: 159–182, 1905.

'06.—A New Gall-Making Psyllid from India. Zeit. f. Insekt. Biologie, 2: 387–390, 1906.

'08.—Galles et d'Insectes Gallicoles d'Asie. Marcellia, 7: 149–167, 1908.

Kieffer, J. J., and Herbst, P. '05.—Psyllid Galls from Chile. Zeit. f. Wiss. Insekt. Biologie, 1: 65, 1905.

'09.—Über einige neue Gallen aus Chile. Centralbl. f. Bakt., 23: 122–123, 1909.

Kieffer, J. J., and Jorgensen, P. '10.—Gallen und Gallentiere aus Argentinien. Centralbl. f. Bakt., (Abt. 2) 27: 362–444, 1910. (Psyllid galls on pp. 372, 386.)

Kirkaldy, G. W. '02.—Fauna Hawaiiensis, 1902: 113–114.

'04.—Nomenclature of Hemiptera. Entomologist, 1904: 254. (Psyllidæ=Chermidæ.)

'05.—Two New Homoptera of the Family Chermidæ. Can. Ent., 37: 290–292, 1905.

'07.—On Two New Vitian Chermidæ. Proc. Hawaiian Ent. Soc., 1: 103–104, 1907.

'08*a*.—A List of the Described Hemiptera (Excluding the Aleyrodidæ and Coccidæ) of Hawaii. Proc. Hawaiian Ent. Soc., 1: 205–206, 1908.

'08*b*.—A Catalog of the Hemiptera of Fiji. Proc. Linn. Soc. N. S. Wales, 33: 390, 1908.

Kuwayama, S. '07.—Die Psylliden Japans I. Trans. Sapporo Nat. Hist. Soc., 2: 149–189. 1907.

'09–10.—Die Psylliden Japans II. Trans. Sapporo Nat. Hist. Soc., 3: 53–66, 1909. 1910.

Lambertie, M. '09.—Contribution a la Faune des Hemipteres, Heteropteres, Cicadines et Psyllides du Sud-Ouest de la France (Ed. 2). Acta Soc. Linn. Bordeaux, 1909: 94–98.

Latreille, P. A. 1810.—Considerations general sur L'Ordre Natural des Animaux des Crustaces, Arachnides, et des Insectes, Paris, 1810: 264–265, and 434.

Leeuwen-Reijnvaan, J. and W. '09*a*.—Einige Gallen aus Java I. Marcellia, 8: 21–36, 1909. (Psyllid galls, p. 25.)

'09*b*.—Einige Gallen aus Java II. Marcellia, 8: 85–119, 1909. (Psyllid galls, pp. 89, 95, 106).

Lefroy, H. M. '09.—Psyllida of India, in Indian Insect Life (Thacker and Spink Co., London), 1909: 742–743.

Lethierry, L. '74.—Catalogue des Hemipteres du Departement du Nord (ed. 2) 1874: 90. Mem. Soc. Imp. des Sc. de l'Agr. et des Arts de Lille.

'90.—Description of a New Psyllid (*Diaphorina guttulata*). Proc. Asiatic Soc. Bengal, 1890: 165–166.

Lethierry, M., and Puton, A. '76.—Hemipteres de Biskra. Ann. Soc. Ent. France, 1876: 54–55.

Lichtenstein, J. '74.—Bull. Soc. Ent. France, 1874: ccxxviii. (A brief note on *Aphalara targionii* n. sp.)

'79.—Description of a New Species of Trioza. Ent. Month. Mag., 16: 82–84, 1879.

Linnaeus, C. 1758.—Systema Naturæ, 1, 1758: 453–455 (*Chermes*).

'61.—Fauna Svecica, 1761: 262–264. (*Chermes*.)

Lintner, J. A. '93.—Injurious Insects of New York, Ninth Report (46th Report of N. Y. State Museum), 1893: 317–329 (The Pear-Tree Psylla), and 404 (Reprint of Fitch '51).

Loew, F. '73.—Zoologische Notizen. Verh. Zool. Bot. Ges. Wien, 23: 141–143, 1873.

'76.—Zur Biologie und Charakteristik der Psylloden nebst Bescreibung zweier neuer Arten der Gattung Psylla. Verh. Zool. Bot. Ges. Wien, 26: 187–216, 1876.

'77*a*.—Beiträge zur Kenntniss der Psylloden. Verh. Zool. Bot. Ges. Wien, 27: 123–154, 1877.

'77*b*.—On the Identity of *T. abieticola* Frst. with *Chermes rhamni* Schrk. (a letter to Douglas). Ent. Month. Mag., 14: 20–21, 1877.

'78*a*.—Zur Systematik der Psylloden. Verh. Zool. Bot. Ges. Wien, 28: 585–610, 1878.

'78*b*.—Diagnoses of Three New Species of Psyllidæ. Ent. Month. Mag., 14: 228–230, 1878.

'79.—Mittheilungen über Psylloden. Verh. Zool. Bot. Ges. Wien, 29: 549–598, 1879.

'80.—Turkestanische Psylloden. Verh. Zool. Bot. Ges. Wien, 30: 251–266, 1880.

'81*a*.—Beiträge zur Biologie und Synonymie der Psylloden. Verh. Zool. Bot. Ges. Wien, 31: 157–170, 1881.

'81*b*.—Beschreibung von zehn neuen Psylloden-Arten. Verh. Zool. Bot. Ges. Wien, 31: 255–268, 1881.

'82*a*.—A New Species of Psylla. Wien. Ent. Zeit., 1: 92–94, 1882.

'82*b*.—Katalog d. Psylliden des Paläarktischen Faunen-Gebietes. Wien Ent. Zeit., 1: 209–214, 1882.

'82*c*.—Comments on Current Literature. Wien. Ent. Zeit., 1: 283, 1882.

'82*d*.—Revision d. Paläarkitschen Psylloden in Hinsicht auf Systematik und Synonymie. Verh. Zool. Bot. Ges. Wien, 32: 227–254, 1882.

Loew, F. '82c.—Zur Characteristik der Psylloden-Genera *Apahalara* und *Rhinocola*. Verh. Zool. Bot. Ges. Wien, 33: 1–6, 1882.

'83.—A New Species of Trioza. Wien. Ent. Zeit., 3: 83–86, 1883.

'84.—Beiträge zur Kenntniss der Jungenstadien der Psylliden. Verh. Zool. Bot. Ges. Wien, 34: 143–152, 1884.

'86.—Neue Beiträge zur Kenntniss der Psylliden. Verh. Zool. Bot. Ges. Wien, 36: 149–170, 1886.

'87.—Übersicht d. Psylliden von Austerreich-Ungarn mit Einschluss von Bosnien und der Herzgowina nebst Beschreibung neuer Arten. Verh. Zool. Ges. Wien, 37: 5–40, 1887.

Loew, H. '47.—Psylla cerastii n. sp. Stettiner Ent. Zeit., 1847: 344.

Mally, C. W. '93.—Hackberry Psyllidæ Found at Ames, Iowa. Proc. Iowa Acad. Sciences, 1: 131–138, 1893.

'94.—Psyllidæ Found at Ames, Iowa. Proc. Iowa Acad. Sciences, 2: 152–171, 1894.

Marlatt, C. L. '95a.—The Pear Tree Psylla in Maryland. Insect Life, 7: 175–185, 1895.

'95b.—The Pear Tree Psylla. U. S. Dep. Agr. Bur. Ent. Circular 7, 1895.

Maskell, W. M. '78.—Coccidæ of New Zealand. Trans. New Zealand Institute, 11: 223–225, 1878.

'89.—Psyllidæ of New Zealand. Trans. New Zealand Institute, 22: 157–170, 1889.

Melichar, L. '05.—Beitrag zur Kenntniss der Homopteren-Fauna Deutsch-Ost-Afrikas. Wien. Ent. Zeit., 24: 304, 1905.

Meyer-Dür '71.—Die Psylloden. Mitth. Schweiz. Ent. Gez., 3: 377, 1871.

Mink, W. '55.—A New Livia. Stettiner Ent. Zeit., 1855: 370–371.

'59.—Kleinere Mittheilungen. Ent. Zeit. in Stettin, 20: 430, 1859.

Newstead, R. '11.—A New Genus of Psyllidæ from Nyasaland, Africa. Bull., Ent. Research, 2: 105–106, 1911.

Newstead, R., and Cummings, B. F. '13.—On a Remarkable Gall-Producing Psyllid from Syria. Ann. and Mag. Nat. History, 9 (ser. 8): 306–308, 1913.

Ormerod, E. A. '78.—Leaf Galls on *Parinarium curatellifolium*. Ent. Month. Mag., 15: 97–99, 1878.

Oshanin, B. '07a.—Catalogue des Hemopteres (Auchenorhynques et Psyllides) du gouv. de St. Petersbourg. Ann. Mus. Zool. Acad. Imp. Sci. St. Petersbourg, 12: 37–40, 1907.

'07b.—Verzeichnis der Palæarktischen Hemipteren, mit Besonderer Berucksichtigung Iher Verteilung im Russischen Reiche. Ann. Mus. Zool. Acad. Imp. Sci. St. Petersbourg, 12: 338–381, 1907.

'10.—Verzeichnis der Palæarktischen Hemipteren, III. Ann. Mus. Zool. Acad. Imp. Sci. St. Petersbourg, 1910: 187–196.

Osten-Sacken, B. '61.—Gall Insects of North America. Ent. Zeit. in Stettin, 1861: 422.

Packard, A. S. '90.—See Riley, C. V. '90, Author of Chapter XII, Hackberry Insects, in Forest and Shade Tree Insects—5th Report U. S. Ent. Comm., 1890: 614–622 Also see p. 805.

Patch, E. M. '09a.—The Downy Psyllid of the Alder, *Psylla floccosa* n. sp. Can. Ent., 41: 301–303, 1909.

'09b.—Homologies of Wing Veins of the Aphididæ, Psyllidæ, Aleyrodidæ, and Coccidæ. Ann. Ent. Soc. America, 2: 101–129, 1909.

'11a.—Psyllidæ of Maine. Maine Agr. Exp. Sta. Bull. 187: 10–20, 1911 (Insect Notes for 1910).

'11b.—Insect Notes for 1911. Maine Agr. Exp. Sta. Bull. 165: 235, 1911.

'12a.—Notes on Psyllidæ, *Livia*. Psyche, 19: 5–8.

'12b.—Notes on Psyllidæ, II. Maine Agr. Exp. Sta. Bull. 202: 215–234, 1912.

PROVANCHER, L. '72.—Nat. Can., 1872: 379.
'86.—Fauna Entomoligique du Canada, 3: 302–308, 1886.

PUTON, A. '71.—Two New Species of Psyllidæ with Observations on Other Species. Ann. Soc. Ent. France, 1871: 435–438.
'73.—Notes on Some Hemiptera. Ann. Soc. Ent. France, 1873: 21–22.
'76.—Notes on Hemiptera. Ann. Soc. Ent. France, 1876: 283–288.
'78.—*Psylla* (*Arytaina*) *retamæ*, n. sp. Bull. Soc. Ent. France, 1878: cxxxiv-v.

REUTER, O. M. '76.—Catalogus Psyllidearum in Fennia hactenus lectarum. Medd. Soc. Fauna et Flora Fenn., 1: 69–77, 1876.
'81.—Till Känednomen om Sveriges Psylloder. Ent. Tidskrift, 2: 145–172, 1881.
'82.—Resumés. Ent. Tidskrift 3: 209, 1882.
'08.—Verzeichnis der auf den Coniferen gefunden Paläarktischen Heteroptera, Auchenorrhyncha und Psylliden. Acta Soc. Scient. Fennicæ, 36: 61–65, 1908. (Also, an extensive bibliography of European works on Hemiptera.)

RILEY, C. V. '76.—Johnson's Universal Encyclopedia, 1876: 425.
'80.—Footnote to Fuller '80: 62. Amer. Ent., 3: 62, 1880.
'83*a*.—Hackberry Psyllid Galls. Can. Ent., 15: 157–158, 1883.
'83*b*.—Proceedings of the American Association for the Advancement of Science, 32: 319, 1883.
'84.—Notes on North American Psyllidæ. Proc. Biol. Soc. Washington, 2: 67–79, 1883.
'90.—Hackberry Psyllids. U. S. Ent. Commission, 5th Report, 1890: 614–622 (see Packard '90).
'91.—The Three Pear Tree Psyllas. Insect Life, 4: 127–128, 1891. (Abstract of Loew '86).

RILEY, C. V. and HOWARD, L. O. '93.—The Pear Tree Psylla. Insect Life, 5: 226, 1893.

RÜBSAAMEN, E. H. '94.—Australian Gall Insects. Berliner Ent. Zeit., 39: 229–230, 1894.
'99.—Gallen aus Europa, Asien, Afrika und Amerika. Ent. Nachricht., 25: 225–281, 1899.
'05.—Gallen von Aussereuropa. Marcellia, 4: 5–71, 1905.
'08.—Gallen aus Brazilien und Peru. Marcellia, 7: 15–79, 1908.
'10.—Gallen aus Persien. Zool. Jahrbücher, 16: 283–295, 1910.

SAJO, KARL '95.—The Control of *Psylla pyricola*. Zeit. f. Pflanzenkr., 5: 28–29, 1895.

SANDERSON, E. D. '12.—Insect Pests of Farm, Garden, and Orchard, 1912: 641 (pear psylla).

SASAKI, C. '09.—On the Life History of *Trioza camphoræ* n. sp. of the Camphor Tree, and its Injuries. Journ. College Agric. Imp. University, Tokyo, 2: 277–286, pls. 15–16, 1909.

SCHOUTEDEN, H. '01.—Hemipteres de Francochamps. Ann. Soc. Ent. Belgique, 45: 270, 1901.

SCHWARZ, E. A. '96.—*Anomoneura mori* n. sp. (Japan). Proc. U. S. National Museum, 19: 295, 1896.
'98.—Notes on the Lerp Insects (Psyllidæ) of Australia. Proc. Ent. Soc. Washington, 4: 66–75, 1898.
'99.—Note on the Cedrela Psyllids (*Freysuila* Aleman). Proc. Ent. Soc. Washington, 4: 195–197, 1899.
'00.—Psyllidæ of the Harriman-Alaska Expedition. Proc. Washington Academy Sciences, 2: 539–540, 1900.
'04*a*.—A Nest-Making Psyllid Larva (*Euphalerus nidifex*). Proc. Ent. Soc. Washington, 6: 153, 1904.
'04*b*.—Notes on North American Psyllidæ I. Proc. Ent. Soc. Washington, 6: 234–245, 1904.

Schwarz, E. A. and Cockerell, T. D. A. '00.—American Naturalist, 34: 290, 1900.

Scott, John '76a.—Diagnoses of Certain Species of Psyllidæ which may be expected to occur in Great Britain. Ent. Month. Mag., 13: 66–67, 1876.

'76b.—Monograph of British Psyllidæ. Trans. Ent. Soc. London, 1876: 525–569.

'76c.—Notes on Some Additional Species of Psyllidæ. Ent. Month. Mag., 13: 137–138, 1876.

'77a.—New British Species of Psyllidæ. Ent. Month. Mag., 13: 282–283, 1877.

'77b.—Description of a New Species of Trioza. Ent. Month. Mag., 14: 31–32, 1877.

'77c.—Description of *Psylla visci* Curtis. Ent. Month. Mag., 14: 94–95, 1877.

'78.—*Psylla rhamnicola* Bred—Description of the Nymph. Ent. Month. Mag., 15: 67–68, 1878.

'79a.—Description of Two New European Psyllidæ. Ent. Month. Mag., 15: 265–267, 1879.

'79b.—Description of a New Species of the Family Psyllidæ—*Floria horvathi* n. sp. Ent. Month. Mag., 16: 84–85, 1879.

'79c.—Description of the Nymph of *Spanioneura fonscolombei* Frst. (Psyllidæ). Ent. Month. Mag., 16: 85–86, 1879.

'79d.—Description of the Female of *Trioza atriplicis* Licht. Ent. Month. Mag., 16: 114–115, 1879.

'80a.—Description of Four New Russian Psyllidæ. Ent. Month. Mag., 16: 250–252, 1880.

'80b.—Description of the Nymph and Imago of *Psylla peregrina* Frst. Ent. Month. Mag., 17: 65–66, 1880.

'80c.—Description of the Nymph of *Arytaina genistæ* Latr. Ent. Month. Mag., 17: 132–133, 1880.

'81a.—Note on *Aphalara nervosa*. Ent. Month. Mag., 18: 18, 1881.

'81b.—Note on the Earlier Stages of *Psylla buxi*. Ent. Month. Mag., 18: 18, 1881.

'82a.—The British Psyllina, With Corrections in the Synonymy. Ent. Month. Mag., 18: 253–256, 1882.

'82b.—Note on *Trioza crithmi* Loew—not yet known to be British. Ent. Month. Mag., 18: 263, 1882.

'82c.—Note on *Aphalara nebulosa* Zett. Ent. Month. Mag., 18: 275, 1882.

'82d.—Further note on *Trioza crithmi*. Ent. Month. Mag., 18: 276, 1882.

'82e.—Food Plants and Times of Appearance of Species of Psyllidæ in Great Britain, with others which may occur here. Ent. Month. Mag., 19: 13–14, 1882.

'82f.—Capture of *Aphalara nebulosa* Zett. Ent. Month. Mag., 19: 42–43, 1882.

'82g.—Description of a Species of Psyllidæ Recently New to Great Britain. Ent. Month. Mag., 19: 64–66, 1882.

'82h.—Description of a New Genus and Two New Species of Psyllidæ from South America. Trans. Ent. Soc. London, 1882: 443–448.

'82i.—On Certain Genera and Species of Psyllidæ in the British Museum. Trans. Ent. Soc. London, 1882: 449–473, 2 pls.

'83a.—Note on *Aphalara subpunctata* Frst. Ent. Month. Mag., 19: 189, 1883.

'83b.—New Localities for *Trioza crithmi*. Ent. Month. Mag., 19: 205, 1883.

'83c.—The Early Life of *Psylla pyricola* Frst. Ent. Month. Mag., 19: 205–206, 1883.

'86a.—Description of the Nymph of *Psylla mali* Schm. Ent. Month. Mag., 22: 281, 1886.

'86b.—Description of the Nymph of *Psyllopsis fraxinicola* Frst. Ent. Month. Mag., 22: 281–282, 1886.

'86c.—Note on *Trioza remota* Frst., with a description of the nymph. Ent. Month. Mag., 22: 282, 1886.

Scudder, S. H. '90.—Tertiary Insects of North America, 2: 175–178, 1890.

Signoret, V. '79.—*Spondiliaspis*, A New Genus of Hemiptera. Bull. Soc. Ent. France, 1879: lxxxv-vii.

'81.—Notes by Signoret. Bull. Soc. Ent. France, 1881: clviii.

Slingerland, M. V. '92.—The Pear Tree Psylla. New York (Cornell) Agr. Exp. Sta. Bull. 44, 1892.

'96.—The Pear Tree Psylla. New York (Cornell) Agr. Exp. Sta. Bull. 108: 691–81, 1896. (Largely a repetition of Bull. 44.)

Smith, J. B. '96.—Economic Entomology, 1896: 137. (*Psylla pyricola.*)

'09.—Insects of New Jersey, 1909: 109. (*Psylla pyricola.*)

Stebbins, F. A. '09.—Insect Galls of Springfield, Massachusetts. Springfield Museum of Natural History, Bull. 2, 1909.

Stough, H. B. '10.—The Hackberry Psylla, *Pachypsylla c.-mamma*. Kansas University Science Bulletin 5: 121–165, 1910. (A treatise on the anatomy of the species.)

Strand, E. '02.—Norske Fund av Hemiptera. Ent. Tidskrift, 23: 269–270, 1902.

Sulc, K. '04.—Popis nové mery *Psylla Dudai* n. sp. Acta Soc. Ent. Bohemiae, 1: 1–4, 1904.

'05.—Revise Psyll skírby Dudovy. Acta Soc Ent. Bohemiae, 2: 1–4, 1905.

'06.—Revise Psyll skírby Dudovy, II. Acta Soc. Ent. Bohemiae, 3: 1–2, 1906.

'07*a*.—Beiträge zur Kenntniss der Psylloden. Bull. Int. Akad. d. Sciences de Bohême, 12: 1–9, 1907.

'07*b*.—Nové zvĕsti o Psyllách. Acta Soc. Ent. Bohemiae, 4: 110–116, 1907.

'08.—*Psylla Lemurica* n. sp., z. Madagaskarn. Acta Soc. Ent. Bohemiae, 5: 77–82, 1908.

'09*a*.—*Trioza cockerelli* n. sp. Acta Soc. Ent. Bohemiae, 6: 102–108, 1909.

'09*b*.—Zur Kenntniss und Synonymie der Weiderbewohnenden Psylla-Arten. Wien. Ent. Zeitung, 28: 11–24, 1909.

'10*a*.—Monographia Generis Trioza Förster. Sitz. Kön. Böhm. Ges Wiss. Prag, 1910: 1–34.

'10*b*.—Úvod do Studia, Synoptická Tabulka a Synonymìcky Katalog Druhu Rodu Psylla palaearktickí. Kral. Ceské Spolecnosti Nauk, 5: 1–46, 1910. (A synopsis of the genus Psylla, with synonymy.)

'10*c*.—Příspĕvky Ku Poznání Psyll. Ceské Akad. Cisare Frant. Josefa, 19: 1–33, 1910; ten plates. (Descriptions and figures of *Psylla*.)

'11.—Monographia Generis Trioza Frst., II. Sitz. Kön. Böhm. Ges. Wiss. Prag, 1911: 1–34, with 10 plates.

'12.—Monographia Generis Trioza Frst., III. Sitz. Kön. Böhm. Ges. Wiss. Prag, 1912: 1–63, pls. 21–35.

'13.—Monographia Generis Trioza Frst., IV. Sitz. Kön. Böhm. Ges. Wiss. Prag, 1913: 1–48, pls. 36–48.

Targioni, T. '79.—Rendiconti Soc. ent. ital., 1879.

Tepper, J. G. '83.—Manna, or Lerp Insects of South Australia. Journ. Linn. Soc. London, 17: 109–111, 1883.

Thomas, C. '79.—Thomas' Third Report—Illinois, Eighth, 1879.

Thomas, Fr. '91.—Die Blattflohkrankheit der Lorbeerbaume. Zeit. f. Pflanzenkr., 8: 92–93, 1891. (*Trioza alacris*.)

Thomson, C. G. '77.—Öfversigt af Skandinaviens Chermes-Arter. Op. Ent., 8: 844, 1877.

Tucker, E. S. '07.—Results of Collecting Insects in Kansas and Colorado. Kansas Univ. Science Bulletin, 4: 69, 1907.

Tyler, C. H. '95.—A Psyllid Leaf-Gall on Celtis, probably *Pachypsylla c.-pubescens* Riley. Psyche, 7: 187–188, 1895.

VOSSELER, J. '06.—Eine Psyllide als Erzeugerin von Gallen am Mwulebaum. Zeit. f. Wiss. Insekt. Biologie, 2: 276–285, 305–316, 1906.

WAGA, M. '42.—*Diraphia*, A New Genus Near *Livia*. Ann. Soc. Ent. France, 1842: 275–278.

WALKER, F. A. '69.—Catalog of the Homoptera of the Indian Archipelago, 1869: 329–330.

WALSH and RILEY, C. V. '69.—Psylla rubi (*Trioza tripunctata*). Amer. Ent., 1: 225, 1869.

WESTWOOD, J. O. '40.—An Introduction to the Modern Classification of Insects, 2: 434–437, 1840; and

Synopsis of Genera of British Insects (in same book), p. 117.

WITLACZIL, EM. '85.—Die Anatomie der Psylliden. Zeit. Wiss. Zool., 42: 569–638, pls. 20–22.

ZETTERSTEDT, J. W. '40.—Insecta Lapponica Descripta, 1840: 308.

EXPLANATION OF PLATES.

LIST OF ABBREVIATIONS.

A.—anal vein.
a.—anus.
ac.—axillary cord.
ant.—antenna.
ap.—apodeme.
asc.—accessory sclerite.
cl.—clypeus.
Cu.—cubitus.
cx.—coxa.
e.—eye.
epm.—epimeron.
eps.—episternum.
f.—frons.
fp.—forceps (male).
fu.—furcae.
g.—gena.
gc.—genal cone.
lab.—labium.
labr.—labrum.
M.—media.
mc.—meracanthus.
mn.—mandibular seta.
mx.—maxillary seta.
o.—ocellus.
P.—pronotum.
p.—penis.
Psc.—praescutum (dorsulum).
pt.—parapteron.
ptb.—preocular tubercle (*Livia.*)
PN.—Pseudonotum.
R.—radius.
Rs.—radial sector.
S.—sternum.
Sc.—subcosta.
Scl.—scutellum.
sp.—spiracle.
tn.—trochantin.
v.—vertex.
w.—wing.
wp.—wing process.

PLATE 1.

[Structure of skeleton.]

FIG. 1. *Arytaina robusta*, lateral view showing sclerites of head and thorax. (See above for explanation of abbreviated terms.) Stippled areas are conjunctival membrane. Dotted lines indicate endoskeleton.
2. *Apsylla cistellata*, lateral view of thorax. Compare metathorax with that of (1).
3. *Livia vernalis*, lateral view of head and thorax.
4. *Psylla alni americana*, lateral view of thorax.
5. *Psylla pyri*, cephalic view of head, showing the sclerites and suppression of the frons.

PLATE 2.

[Structure of skeleton.]

6. *Euphyllura arbuti*, sclerites of thorax.
7. *Trioza albifrons*, same.
8. *Psylla pyricola*, same, with base of abdomen, also.
9. *Apsylla cistellata*, ventral view of head and thorax.
10. *Psylla alni americana*, metacoxa, metafurcæ, part of epimeron, metasternum and chitinous process from metafurcæ connecting the endoskeleton with the inner surface of the exoskeleton. The episternum and most of the epimeron is removed.
11. Same, caudal view.
12. *Apsylla cistellata*, caudal view of metathorax, partially diagrammatic, showing comparatively simple metafurcæ.

PLATE 3.

[Structure of skeleton.]

13. *Psylla pyricola* (male), lateral view of abdomen, distended, showing segments, spiracles, and atrophied and modified sclerites.
14. Same, female.

FIG. 15. *Psylla alni americana*, showing frons, clypeus, labrum, labium, etc.
16. *Paurocephala magnifrons*, front view of head, showing frons, clypeus, etc.
17. *Apsylla cistellata*, corresponding view as in (16), but actually ventral.
18. *Aphalara veaziei*, same.
19. *Phacopteron lentiginosum*, same.
20. *Livia coloradensis*, same.
21. *Psyllopsis fraxinicola*, same, more enlarged.

PLATE 4.

[Lateral and cephalic views of head.]

22. *Livia juncorum*, lateral aspect.
23. Same, cephalic aspect.
24. *L. vernalis*, ventral aspect.
25. *L. maculipennis*, cephalic.
26. *L. vernalis*, lateral.
27. *L. coloradensis*, cephalic.
28. *L. caricis*, lateral.
29. *Rhinocola aceris*, ventral aspect.
30. Same, cephalic.
31. Same, lateral.
32. *Eupyllura arctostaphyli*, lateral.
33. *Livia coloradensis*, lateral.
34. *Euphyllura arctostaphyli*, cephalic.
35. *Eu. phillyreæ*, lateral.
36. Same, cephalic.

PLATE 5.

[Views of head.]

37. *Ceriacremum setosum*, cephalic.
38. *Euphalerus nidifex*, cephalic.
39. *E. vermiculosus*.
40. *E. nidifex*, lateral.
41. *E. vermiculosus*, lateral.
42. *Arytaina genistæ*, lateral.
43. *Ceriacremum setosum*, lateral.
44. *Floria spectabilis*, lateral.
45. *F. radiata*, lateral.
46. *Psyllopsis mexicana*, lateral.
47. *P. fraxinicola*, lateral.
48. *P. fraxini*, lateral.
49. Same, cephalic.
50. *Arytaina robusta*, lateral.
50a. Same, cephalic.
51. *A. fuscipennis*, lateral.
52. *A. pubescens*.
53. *A. amorphæ*.
54. *Aphalaroida succincta*.
55. *A. ericæ*.
56. *Arytaina robusta*.
57. *A. assimilis*.
58. *A. ceanothæ*.
59. *Aphalaroida pithecolobia*.
60. *Arytaina minuta*.

PLATE 6.

[Views of head.]

FIG. 61. *Katacephala arcuata*, lateral.
62. Same, cephalic.
63. *Pachypsylla vesiculum*.
64. *P. mamma*.
65. *P. venusta*, cephalic.
66. Same, lateral.
67. *P. gemma*.
68. *Heteropsylla mexicana*.
69. *H. cubana*.
70. *H. texana*.
71. *Amblyrhina cognata*, lateral.
72. Same, cephalic.
73. *Paurocephala magnifrons*.
74. *Calophya triozomima*.
75. *C. californica*.
76. *C. nigripennis*.
77. *Psylla annulata*.
78. *Mitrapsylla albalineata*, cephalic.
79. Same, lateral.
80. *Psylla annulata*.
81. *Psylla* sp. (not described).
82. *P. floccosa*.

PLATE 7.

[Views of head.]

83. *Arytaina ribesiæ*.
84. Same.
85. *Psylla alni americana*.
86. *P. carpinicola*.
87. *P. astigmata*.
88. *P. caudata*.
89. *P. alni americana*.
90. *P. cephalica*.
91. *P. carpinicola*.
92. *P. brevistigmata*.
93. Same, cephalic.
94. *P. minuticona*.
95. *P. orizabensis*.
96. *P. torrida*.
97. *Psylla* sp. (not described).
98. *P. fibulata*.
99. *P. minuta*.
100. *P. maculata*.
101. *P. americana*.

PLATE 8.

[Views of head and genitalia.]

102. *Paurocephala ilicis*, lateral.
103. Same, cephalic.
104. Same, male cauda.
105. Same, forceps, caudal view.
106. *Aphalara calthæ*, cephalic.

FIG. 107. *A. pulchella.*
108. *Paurocephala ilicis*, female cauda.
109. *Aphalara alaskensis*, one of male forceps.
110. *A. suaedae*, head.
111. *A. alaskensis*, head.
112. Same, male genitalia, lateral aspect.
113. *Heteropsylla quassiae*, male forceps.
114. *Uhleria mira*, head and part of thorax.
115. Same, cephalic, of head.
116. *Heteropsylla forcipata*, male forceps.
117. *H. quassiæ*, male genital segment.
118. *H. forcipata*, same.
119. *H. fusca*, male forceps.
120. *Katacephala grandiceps*, head.
121. Same, lateral aspect.
122. *Freysuila dugesii*, head.
123. *Rhinopsylla athenæ*, head.
124. *Freysuila dugesii*, basal part of antenna.
125. *Heteropsylla fusca*, male genitalia.
126. *Katacephala grandiceps*, male forceps.
127. Same, male genital segment.

PLATE 9.

[Views of head and genitalia.]

128. *Tetragonocephala flava*, head.
129. Same, male forceps, caudal view.
130. *Psylla hartigii*, male forceps.
131. *Euphalerus propinquus*, head.
132. *Aphalara alaskensis*, female cauda.
133. *Psylla breviata*, male cauda.
134. *Euphalerus rugipennis*, head.
135. *Arytaina chelifera*, male forceps, caudal view.
136. Same, lateral view.
137. *Trioza alacris*, male cauda.
138. *Ceropsylla sideroxyli*, head.
139. *Trioza stylifera*, male forceps.
140. *T. lobata*, male cauda.
141. *Leuronota longipennis*, head.
142. *Psylla floccosa*, female cauda.
143. *Trioza lobata*, male forceps.
144. *Psylla galeaformis*, female cauda.
145. *P. hartigii*, same.

PLATE 10.

[Views of head and male cauda.]

146. *Carsidara concolor*, head, lateral aspect.
147. *C. mexicana*, head.
148. *C. dugesii*, head.
149. *C. gigantea*, head.
150. *C. dugesii*, cephalic view of head.
151. *C. gigantea*, same.
152. *Epicarsa corniculata*, head, lateral.
153. Same, cephalic.
154. *Rhinopsylla jalapensis*, lateral.
155. Same, cephalic.

FIG. 156. *Ceropsylla johnsonii*, head, lateral.
157. *Epicarsa corniculata*, male cauda.
158. *Ceropsylla johnsonii*, same.
159. *Carsidara concolor*, same.
160. *C. mexicana*, same.

PLATE 11.

[Views of head and male cauda.]

161. *Aphalara calthæ*, head, lateral-aspect.
162. *A. angustipennis*, same.
163. *A. veaziei*, same.
164. *A. rumicis*, same.
165. *A. calthæ*, same.
166. *A. picta*, same.
167. *A. nebulosa kincaidi*, same.
168. *A. pulchella*, same.
169. *A. minutissima*, same.
170. *A. calthæ*, male cauda.
171. Same.
172. *A. veaziei*, same.
173. *A. picta*, same.
174. *A. nebulosa kincaidi*, same.
175. *A. nebulosa kincaidi*, same.
176. *A. pulchella*, same.
177. *A. minutissima*, same.
178. *Rhinopsylla jalapensis*, same.

PLATE 12.

[Views of head.]

179. *Trioza diospyri*, lateral.
180. *Leuronota maculata*, lateral.
181. Same, cephalic.
182. *Trioza viridis*, cephalic.
183. Same, lateral.
184. *T. frontalis*, lateral.
185. *T. collaris*, cephalic.
186. *Leuronota acutipennis*.
187. *Trioza collaris*.
188. *T. albifrons*.
189. *T. arizonæ*.
190. *T. maura*.
191. *T. salicis*.
192. *T. maura*.
193. *T. longicornis*.
194. *T. varians*.
195. *T. salicis*.
196. Same, cephalic.
197. *Paratrioza arbolensis*.

PLATE 13.

[Views of head.]

198. *Trioza tripunctata*, lateral.
199. *T. magnoliæ*.
200. *Paratrioza arbolensis*.
201. *Trioza longistylus*.

FIG. 202. *T. salicis.*
203. *Kuwayama oaxacensis.*
204. *K. medicaginis.*
205. *Neotriozella immaculata.*
206. *N. laticeps.*
207. *Paratrioza arbolensis.*
208. *Kuwayama medicaginis.*
209. *Trioza quadripunctata.*
210. *T. mexicana.*
211. *Paratrioza cockerelli.*
212. *Trioza nicaraguensis.*
213. *Neotriozella immaculata.*
214. *N. laticeps.*
215. *Rhinopsylla antennata.*
216. *Neotriozella immaculata.*

PLATE 14.

[Views of male cauda.]

217. *Livia vernalis.*
218. *L. juncorum.*
219. *Rhinocola aceris.*
220. *Ceriacremum setosum.*
221. *Livia caricis.*
222. *L. coloradensis.*
223. *Euphyllura olivina.*
224. *E. phillyreæ.*
225. *Euphalerus vermiculosus.*
226. *Floria spectabilis.*
227. *Arytaina genistæ.*
228. *Psyllopsis mexicana.*
229. *Arytaina fuscipennis.*
230. *Psyllopsis fraxinicola.*
231. *P. fraxini.*
232. *Arytaina pubescens.*
233. *A. fuscipennis.*
234. *A. minuta.*
235. *A. amorphæ.*
236. *A. robusta.*
237. *A. assimilis.*
238. *Aphalaroida succincta.*
239. *A. pithecolobia.*
240. *Arytaina ceanothæ.*
241. *Pachypsylla vesiculum..*
242. *P. c.-mamma.*
243. *P. c.-gemma.*
244. *Heteropsylla mexicana.*

PLATE 15.

[Views of male cauda.]

245. *Heteropsylla cubana.*
246. *H. texana.*
247. *Amblyrhina cognata.*
248. *Calophya californica.*
249. *Mitrapsylla albalineata.*
250. *Calophya nigripennis.*
251. *Psylla floccosa.*

FIG. 252. *Arytaina ribesiæ.*
253. Same, variation in size.
254. *Psylla alba.*
255. *Pachypsylla venusta.*
256. *Psylla astigmata*, tip of male forceps.
257. Same, male cauda.
258. *P. annulata.*
259. *P. caudata.*
260. *P. alni americana.*
261. *P. minuta.*
262. *P. carpinicola.*
263. *P. cephalica.*
264. *P. brevistigmata.*
265. *P. americana.*
266. *P. fibulata.*
267. *P. sinuata.*
268. Same, caudal view.
269. *P. torrida.*

PLATE 16.

[Views of female cauda.]

270. *Livia vernalis.*
271. *L. juncorum.*
272. *Ceriacremum setosum.*
273. *Rhinocola aceris.*
274. *Euphyllura phillyreæ.*
275. *Livia coloradensis.*
276. *Arytaina genistæ.*
277. *Floria radiata.*
278. *Ceriacremum setosum* (tibial spur).
279. *Euphyllura arctostaphyli.*
280. *Psyllopsis fraxinicola.*
281. *Euphalerus nidifex.*
282. *Psyllopsis fraxini.*
283. *Arytaina robusta.*
284. *Aphalaroida pithecolobia.*
285. *Arytaina robusta.*
286. *A. minuta.*
287. *A. pubescens.*
288. *A. fuscipennis.*
289. *A. amorphæ.*
290. *A. ceanothæ.*
291. *Aphalaroida ericæ.*

PLATE 17.

[Views of female cauda.

292. *Pachypsylla vesiculum.*
293. *Heteropsylla mexicana.*
294. *H. cubana.*
295. *H. texana.*
296. *Paurocephala magnifrons.*
297. *Calophya triozomima.*
298. *C. californica.*
299. *C. nigripennis.*

FIG. 300. *Mitrapsylla albalineata.*
301. *Psylla annulata.*
302. *P. floccosa.*
303. *Psylla* sp. (not described).
304. *Arytaina ribesiæ.*
305. *Psylla caudata.*
306. *Arytaina ribesiæ.*
307. *Psylla alni americana.*
308. *P. brevistigmata.*
309. *P. cephalica.*
310. *P. alni americana.*

PLATE 18.

[Views of female cauda.]

311. *Psylla astigmata.*
312. *P. torrida.*
313. *Psylla* sp. (not described).
314. *P. fibulata.*
315. *P. maculata.*
316. *P. minuta.*
317. *P. carpinicola.*
318. *P. americana.*
319. *P. magnicauda*
320. *P. cratægi.*
321. *P. alba.*
322. *P. pruni.*
323. *P. viburni.*
324. *P. pyrisuga.*
325. *P. mali.*
326. *P. melanoneura.*
327. *P. terminalis.*
328. *P. foersteri.*
329. *P. hippophæs.*

PLATE 19.

[Views of male and female cauda.]

330. *Paratrioza cockerelli.*
331. Same, variation in anal valve.
332. *Neotriozella immaculata.*
333. *Rhinopsylla antennata.*
334. *Trioza tripunctata*, female cauda.
335. *T. salicis.*
336. *T. quadripunctata.*
337. *T. salicis.*
338. *T. longistylus.*
339. *T. nicaraguensis.*
340. *T. mexicana.*
341. *T. salicis.*
342. *T. frontalis.*
343. *T. magnoliæ.*
344. *T. albifrons.*
345. *Paratrioza arbolensis.*
346. *Kuwayama medicaginis.*
347. *K. oaxacensis.*
348. *Paratrioza cockerelli.*
349. *Neotriozella laticeps.*

PLATE 20.

[Views of male and female cauda.]

FIG. 350. *T. collaris*.
351. *T. viridis*.
352. *Leuronota maculata*.
353. *Trioza viridis*.
354. *T. maura*.
355. *T. frontalis*.
356. *T. diospyri*.
357. *T. arizonæ*.
358. *T. frontalis*.
359. Same, caudal view.
360. *T. diospyri*.
361. *T. albifrons*.
362. *T. frontalis*.
363. *T. arizonæ*.
364. *T. salicis*.
365. *T. maura*.
366. *T. quadripunctata*.
367. *T. longicornis*.
368. *T. tripunctata*.
369. *T. varians*.
370. *T. maura*.
371. Same, forceps of male, lateral.
372. Same, male cauda.

PLATE 21.

[Views of male and female cauda.]

373. *Carsidara gigantea*, female cauda.
374. *C. dugesii*.
375. *C. concolor*.
376. *Rhinopsylla jalapensis*.
377. *Aphalara calthæ*.
378. *A. angustipennis*.
379. *A. pulchella*.
380. *A. calthæ*.
381. *A. minutissima*.
382. *A. calthæ*.
383. *A. picta*.
384. *A. rumicis*.
385. *Carsidara mexicana* (tibial spur).
386. *Aphalara veaziei*.
387. *Trioza salicis*, male cauda.
388. *T. proximata*, same.
389. *T. mexicana*.
390. *T. magnoliæ*.
391. *Paratrioza arbolensis*.
392. *P. maculipennis*.
393. *Kuwayama medicaginis*.

PLATE 22.

[Wings, etc.]

394. *Trioza breviantennata*, head.
395. *Psylla pyri*, explaining wing venation.
396. *Trioza breviantennata*, male cauda.
397. *Aphalaroida acaciæ*.

FIG. 398. *A. inermis.*
399. *A. spinifera.*
400. *Euphalerus propinquus.*
401. *Trioza lobata.*
402. *Hemitrioza sonchi.*
403. *Aphalara alaskensis.*
404. *Aphalaroida prosopis.*
405. *Leuronota longipennis.*
406. *Euphalerus rugipennis.*

PLATE 23.

[Wings.]

407. *Ceropsylla sideroxyli.*
408. *Freysuila dugesii.*
409. *Rhinopsylla athenæ*
410. *Paurocephala ilicis.*
411. *Uhleria mira.*
412. *Arytaina chelifera.*
413. *Psylla alaskensis.*
414. *Trioza stylifera.*
415. *Kuwayama dorsalis.*
416. *Katacephala grandiceps.*
417. *Freysuila cedrelæ.*
418. *Tetragonocephala flava.*
419. *Calophya flavida.*
420. *C. dubia.*
421. *Trioza alacris.*
422. *T. breviantennata.*

PLATE 24.

Wings.]

423. *Livia vernalis.*
424. *L. caricis.*
425. *L. maculipennis.*
426. *L. coloradensis.*
427. *L. juncorum.*
428. *Rhinocola aceris.*
429. *Euphyllura olivina.*
430. *E. phillyreæ.*
431. *E. arctostaphyli.*
432. *Ceriacremum setosum.*
433. *Euphalerus nidifex.*
434. *E. vermiculosus.*
435. *Floria spectabilis.*
436. *Arytaina genistæ.*
437. *Floria radiata.*
438. *Psyllopsis mexicana.*
439. *P. fraxinicola.*

PLATE 25.

[Wings.]

440. *Psyllopsis fraxini.*
441. *Arytaina amorphæ.*
442. *A. ceanothæ.*
443. *A. pubescens.*
444. *A. robusta.*
445. Same, variation in color.

FIG. 446. *A. minuta.*
447. *A. fuscipennis.*
448. *A. assimilis.*
449. *Aphalaroida pithecolobia.*
450. *Katacephala arcuata.*
451. *Pachypsylla venusta.*
452. *P. mamma.*
453. *P. gemma.*
454. *P. vesiculum.*
455. *Heteropsylla mexicana.*
456. *H. texana.*
457. *Amblyrhina cognata.*
458. *Heteropsylla cubana.*
459. *Aphalaroida succincta.*
460. *A. ericæ.*

PLATE 26.

[Wings.]

461. *Paurocephala magnifrons.*
462. *Calophya triozomima.*
463. *C. californica.*
464. *C. nigripennis.*
465. *Mitrapsylla albalineata.*
466. *Psylla annulata.*
467. *P. floccosa.*
468. *Arytaina ribesiæ.*
469. *Psylla* sp. (not described).
470. *Arytaina ribesiæ.*
471. *Psylla astigmata.*
472. *P. caudata.*
473. *P. carpinicola.*
474. *P. torrida.*
475. *P. cephalica.*

PLATE 27.

[Wings.]

476. *Psylla alni.*
477. *P. alni americana.*
478. *P. carpinicola.*
479. *P. orizabensis.*
480. *P. minuticona.*
481. *Psylla* sp. (not described).
482. *P. fibulata.*
483. *P. minuta.*
484. *P. brevistigmata.*
485. *P. maculata.*
486. *P. americana.*
487. *P. americana.*
488. *P. americana.*
489. *P. magnicauda.*
490. *P. alba.*
491. *P. sinuata.*

PLATE 28.

[Wings.]

492. *Carsidara gigantea.*
493. *Rhinopsylla jalapensis.*
494. *Carsidara dugesii.*

FIG. 495. *C. concolor.*
496. *C. mexicana.*
497. *Epicarsa corniculata.*
498. *Ceropsylla johnsonii.*
499. *Aphalara pulchella.*
500. *A. calthæ.*
501. *A. rumicis.*
502. *A. angustipennis.*
503. *A. angustipennis.*
504. *A. calthæ.*
505. *A. veaziei.*
506. *A. picta.*
507. *A. minutissima.*
508. *A. nebulosa kincaidi.*

PLATE 29.

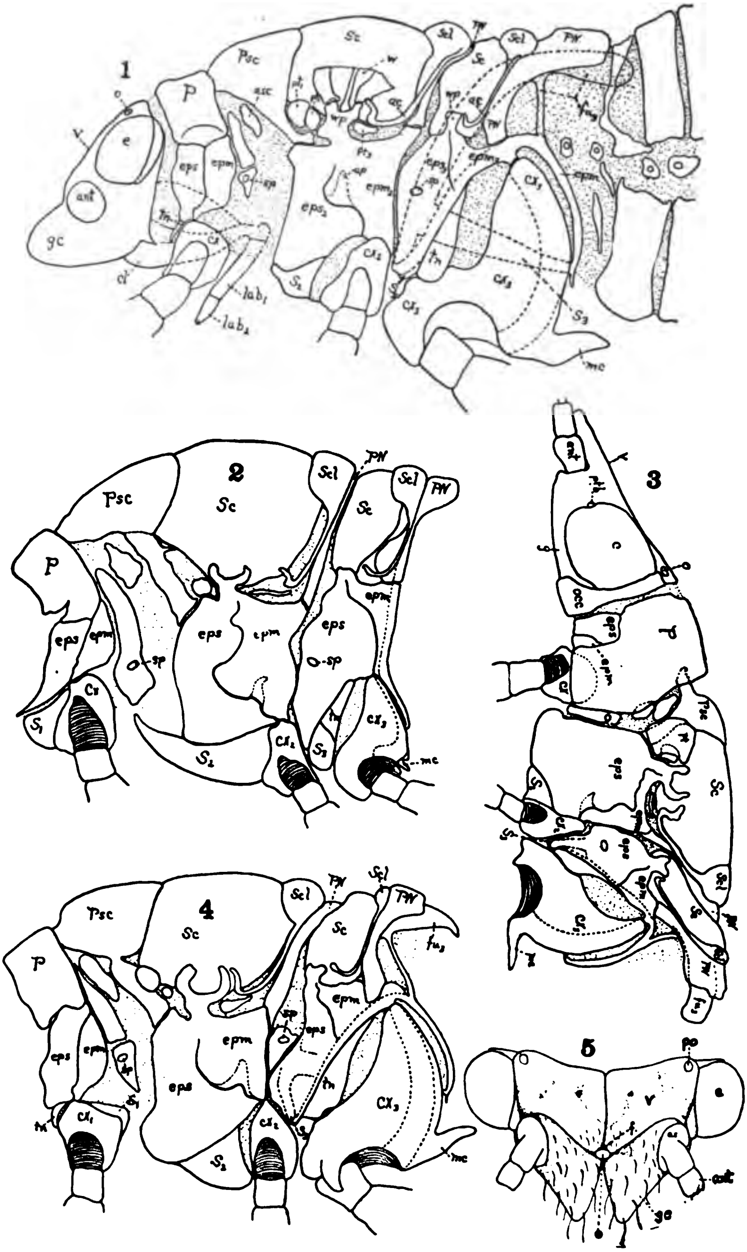
[Wings.]

509. *Trioza collaris.*
510. *Leuronota maculata.*
511. *Trioza viridis.*
512. *Leuronota acutipennis.*
513. *Trioza frontalis.*
514. *T. albifrons.*
[illegible]15. *T. arizonæ.*
516. *T. salicis.*
517. *T. maura.*
518. *T. frontalis.*
519. *T. diospyri.*
520. *T. maura.*
521. *T. longicornis.*
522. *T. maura.*
523. *T. varians.*

PLATE 30.

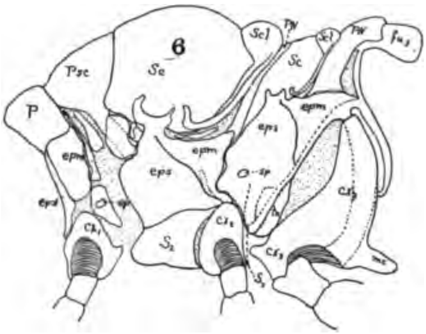
[Wings.]

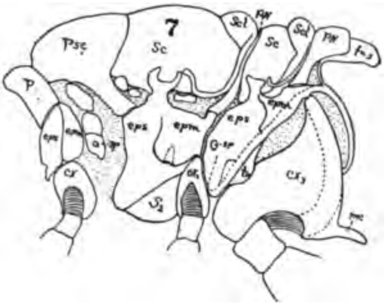
524. *Trioza tripunctata.*
525. *T. salicis.*
526. *T. salicis.*
527. *T. quadripunctata.*
528. *T. longistylus.*
529. *T. proximata.*
530. *T. salicis.*
531. *T. mexicana.*
532. *Paratrioza arbolensis.*
533. *Trioza magnoliæ.*
534. *T. nicaraguensis.*
535. *Paratrioza cockerelli.*
536. Same.
537. *Kuwayama medicaginis.*
538. *Neotriozella laticeps.*
539. *N. immaculata.*
540. *Kuwayama oaxacensis.*
541. *Rhinopsylla antennata.*

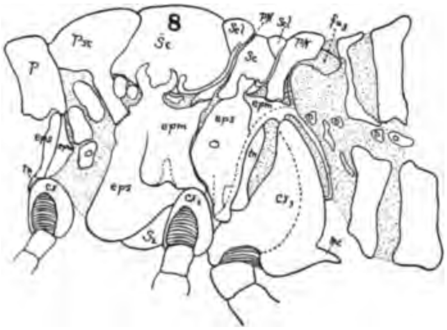


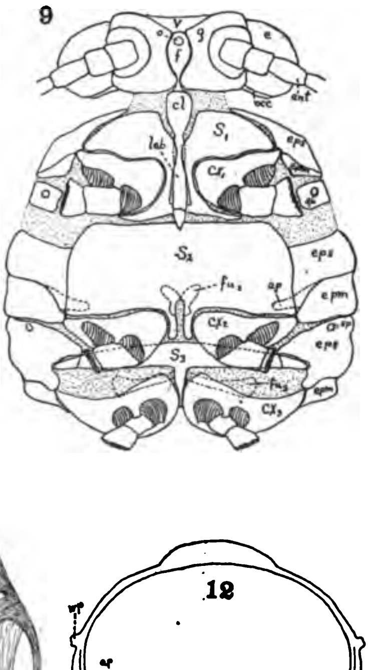
SCLERITES OF THE HEAD AND THORAX OF PSYLLIDÆ.

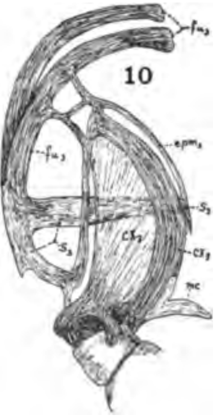
FOR EXPLANATION OF PLATE SEE PAGE 171.

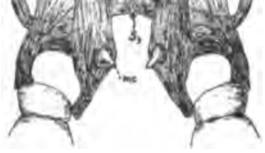


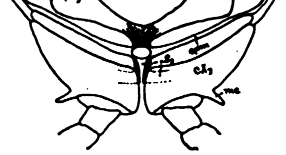






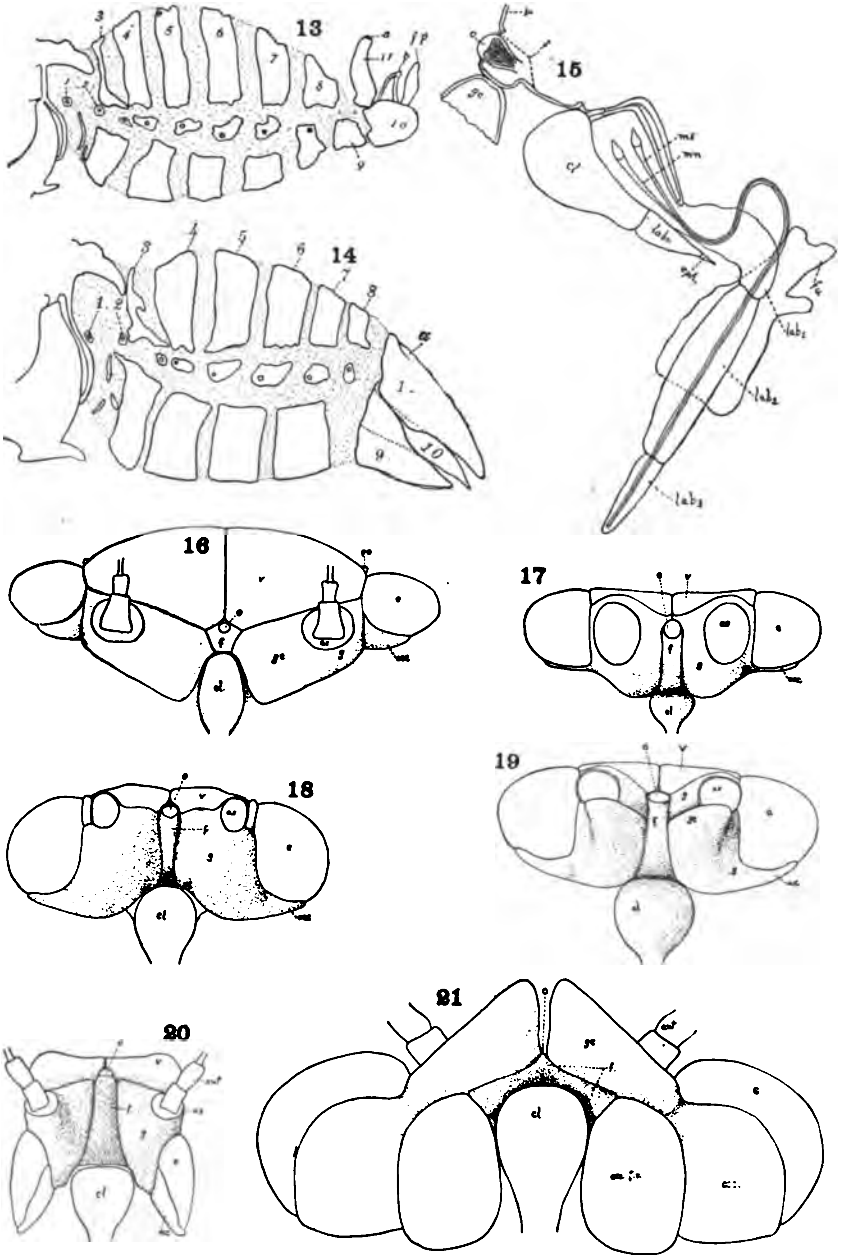






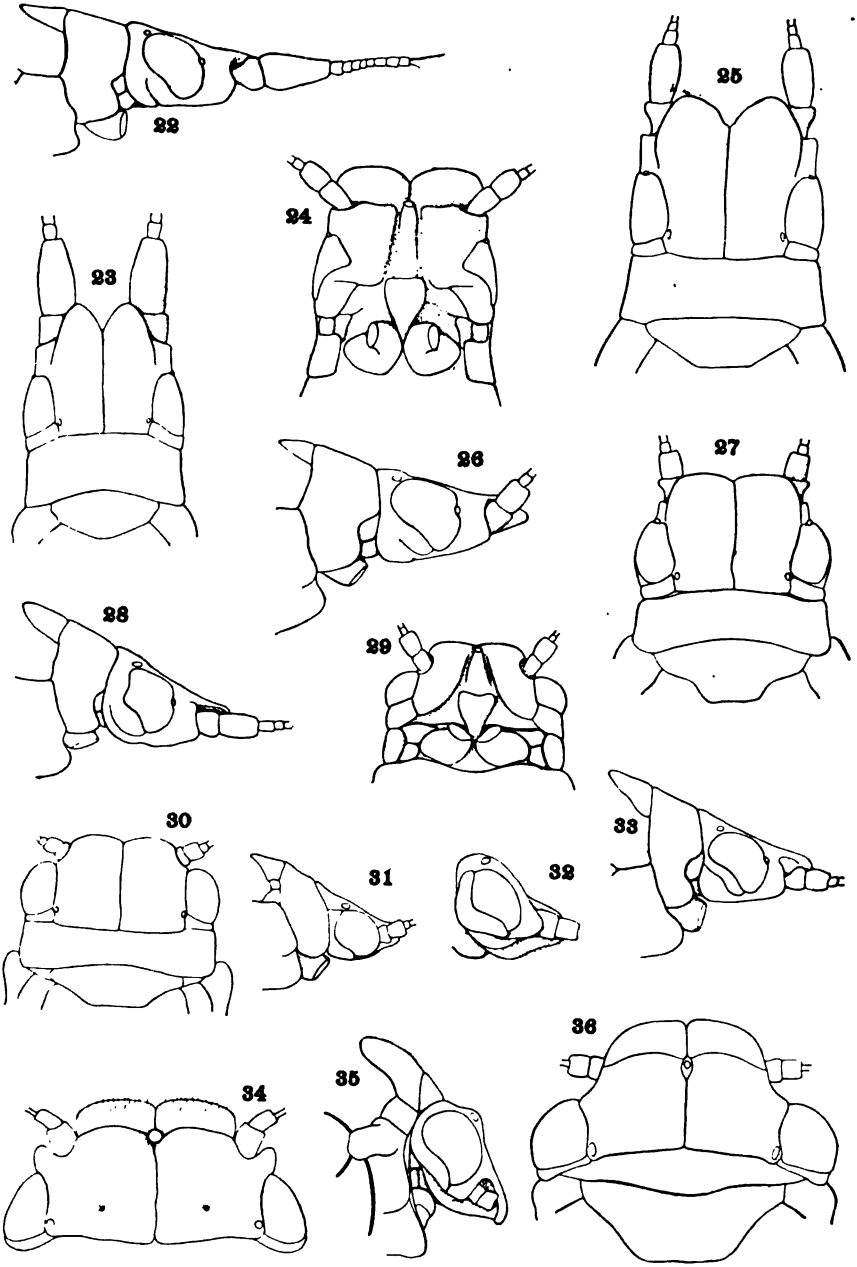
EXTERNAL AND INTERNAL SKELETON OF THE THORAX.

FOR EXPLANATION OF PLATE SEE PAGE 171.



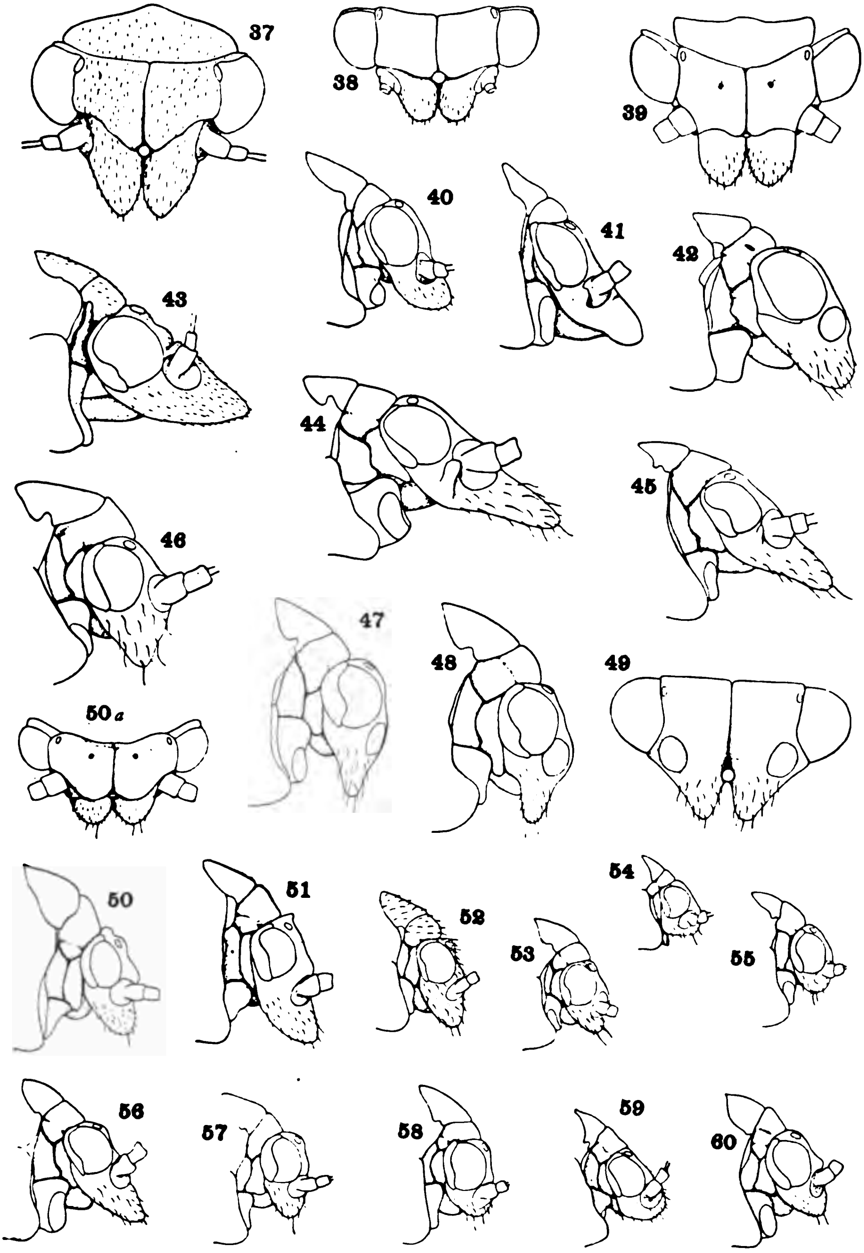
SCLERITES OF THE HEAD AND THE ABDOMEN.

FOR EXPLANATION OF PLATE SEE PAGES 171 AND 172.



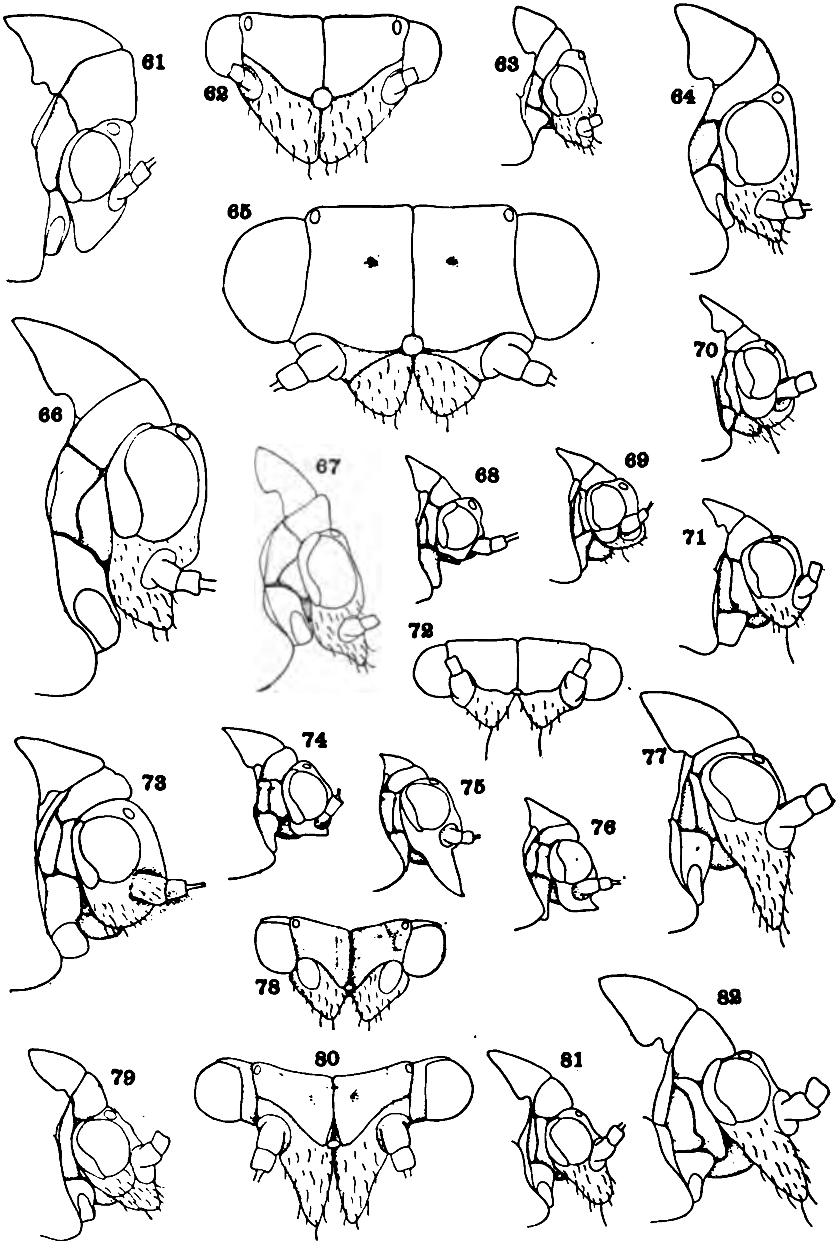
Dorsal, Lateral, and Ventral Aspects of the Head of Psyllidæ.

For explanation of plate see page 172.



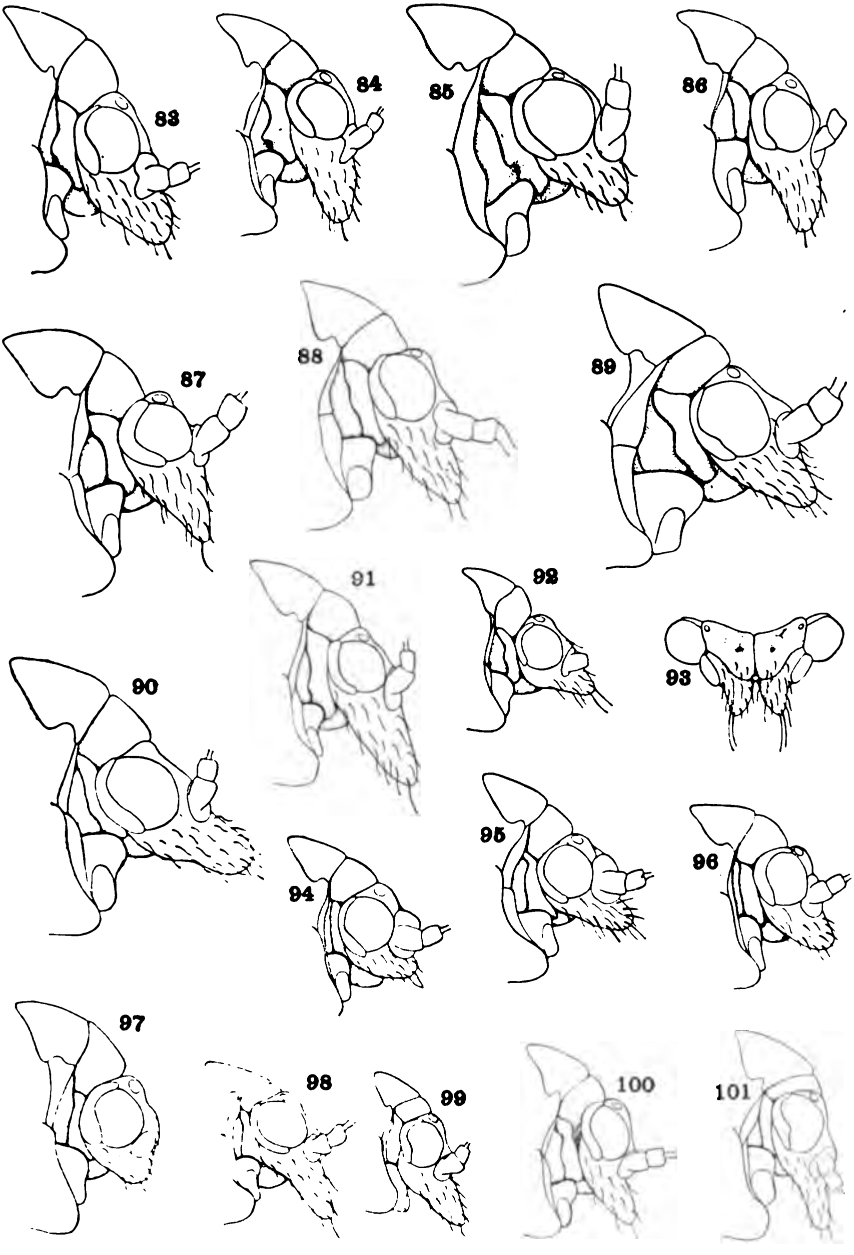
DORSAL AND LATERAL ASPECTS OF THE HEAD.

FOR EXPLANATION OF PLATE SEE PAGE 172.



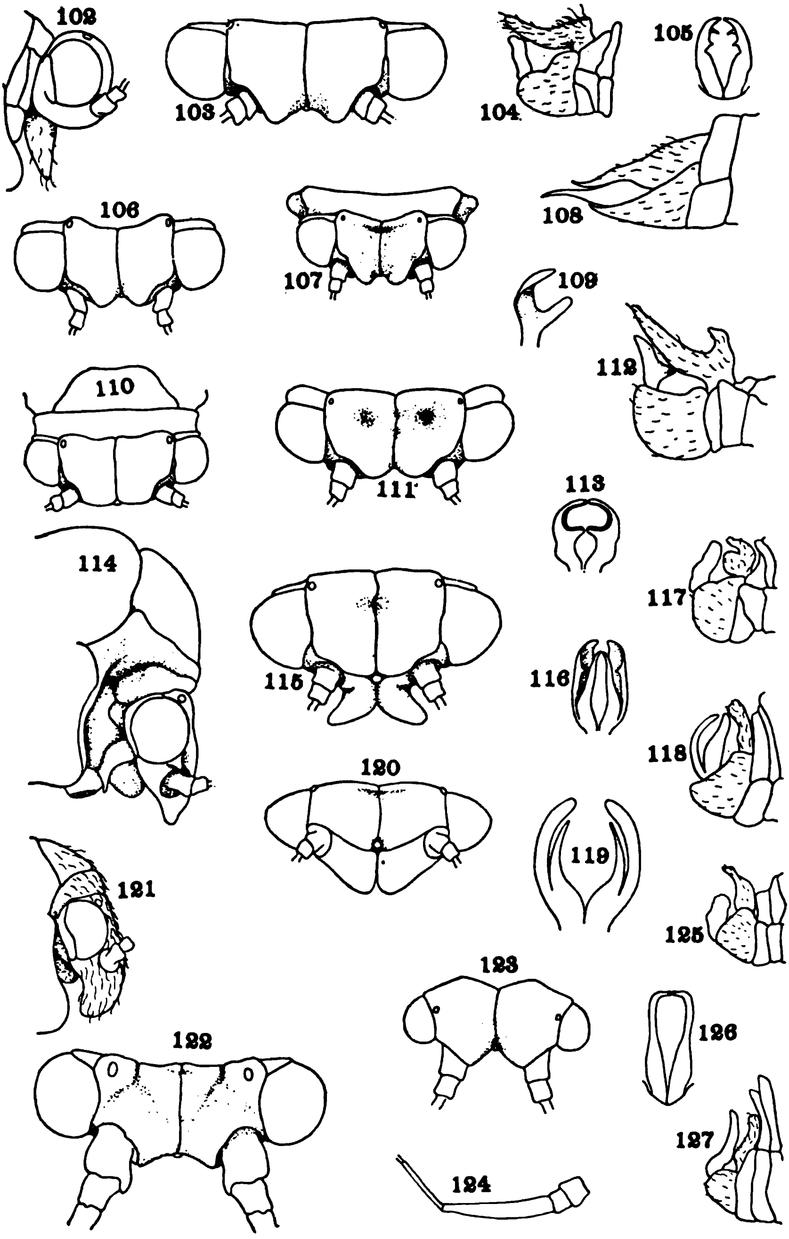
Dorsal and Lateral Aspects of the Head

For explanation of plate see page 173.



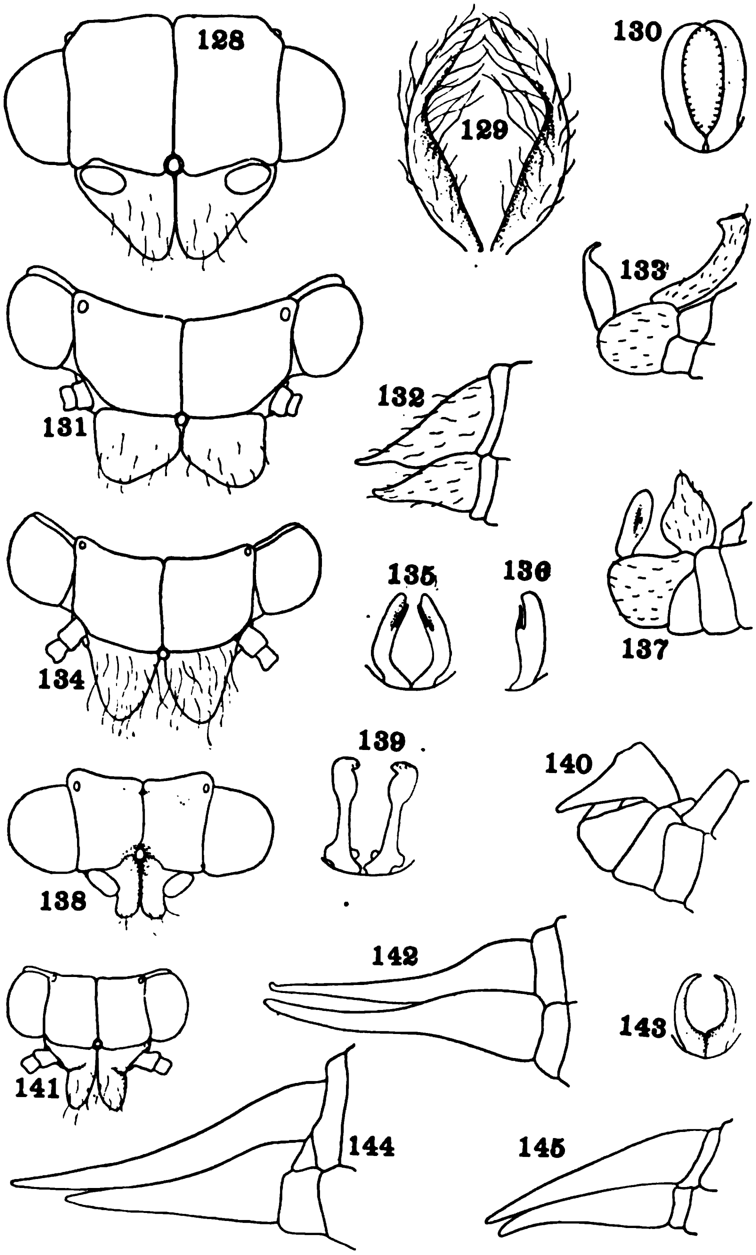
DORSAL AND LATERAL ASPECTS OF THE HEAD.

FOR EXPLANATION OF PLATE SEE PAGE 173.



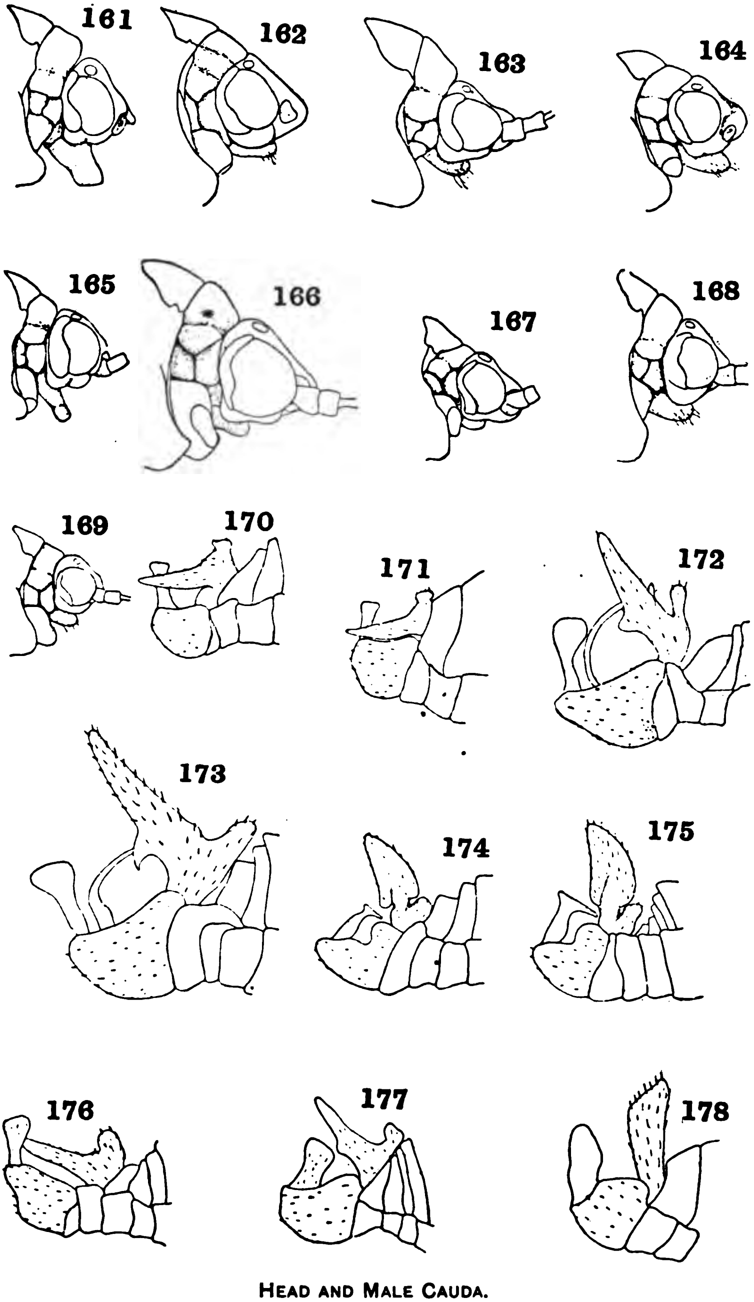
VIEWS OF THE HEAD AND MALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGES 173 AND 174.



Views of the Head and Cauda of Both Sexes

For explanation of plate see page 174.



HEAD AND MALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGE 175.

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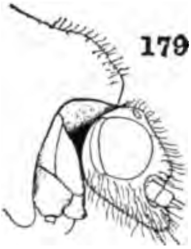

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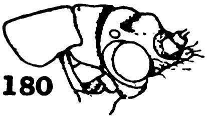

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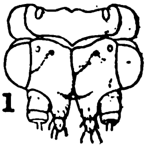

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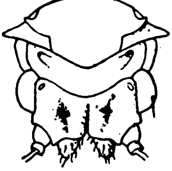

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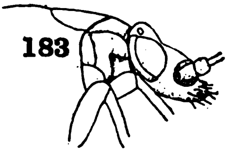

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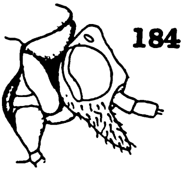

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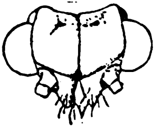

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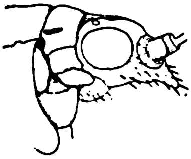

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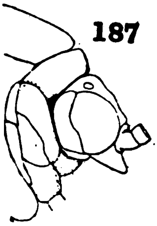

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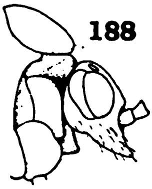

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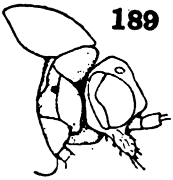

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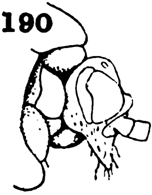

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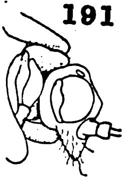

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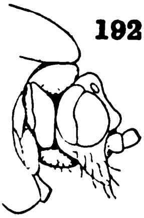

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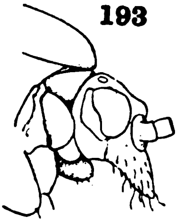

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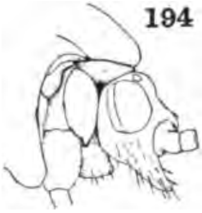

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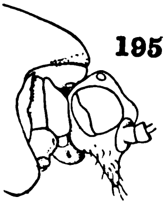

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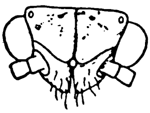

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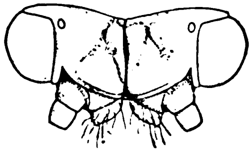
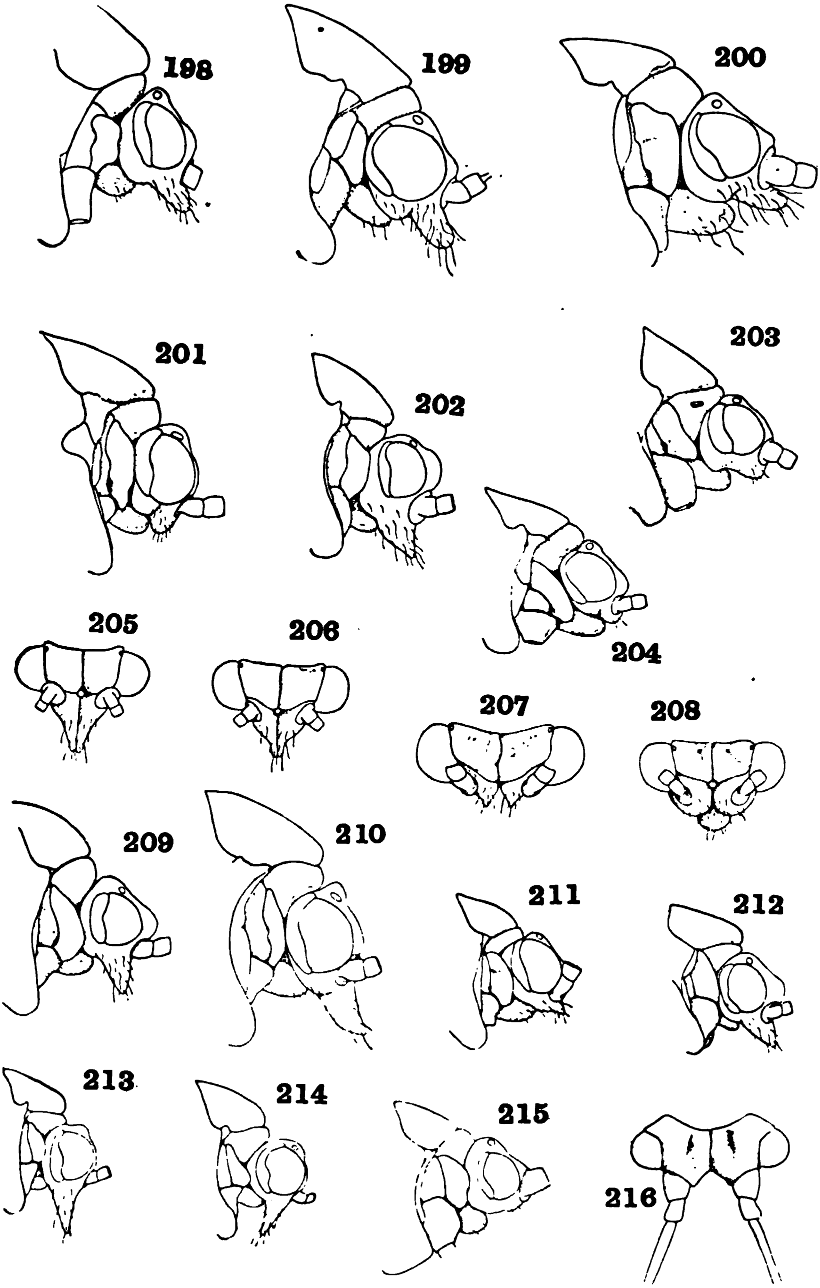


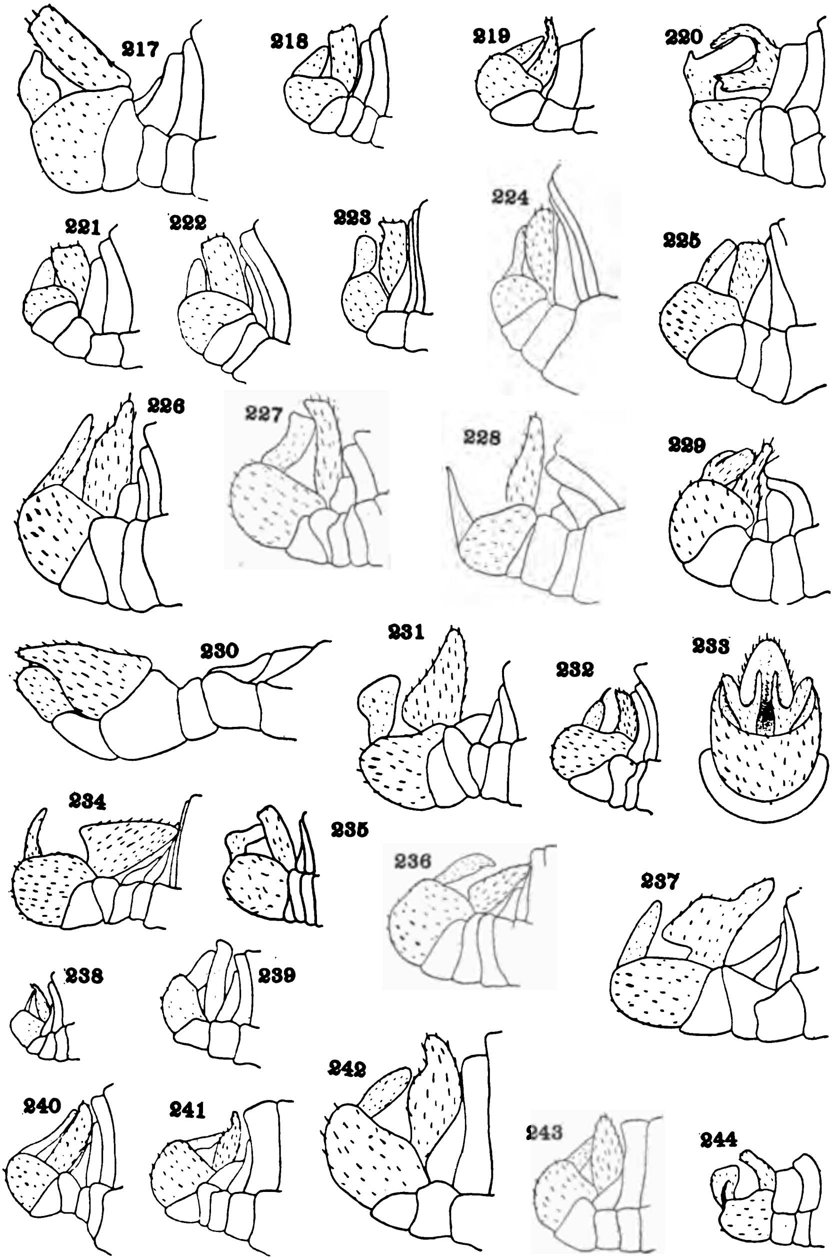
Dorsal and Lateral Aspects of the Head.

For explanation of plate see page 175.



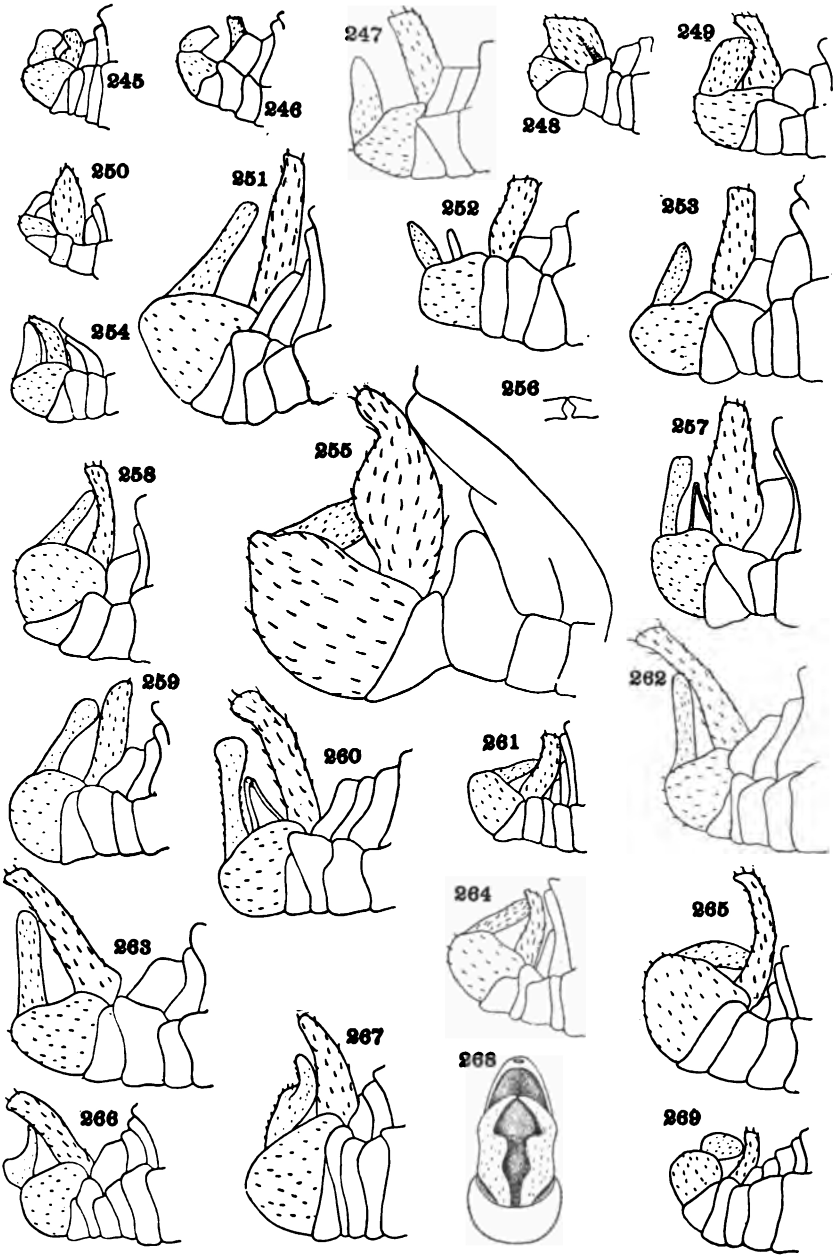
Dorsal and Lateral Aspects of the Head.

For explanation of plate see pages 175 and 176.



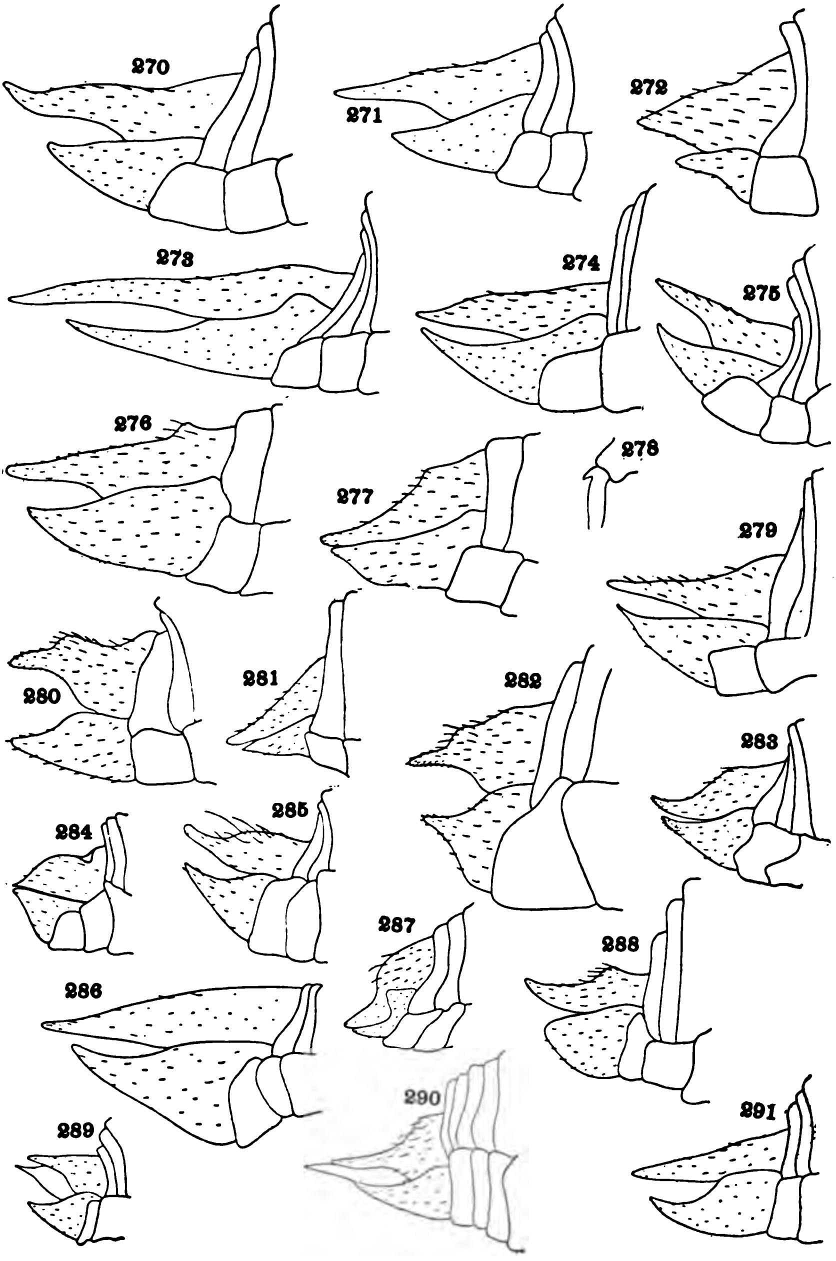
LATERAL ASPECT OF THE MALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGE 176.



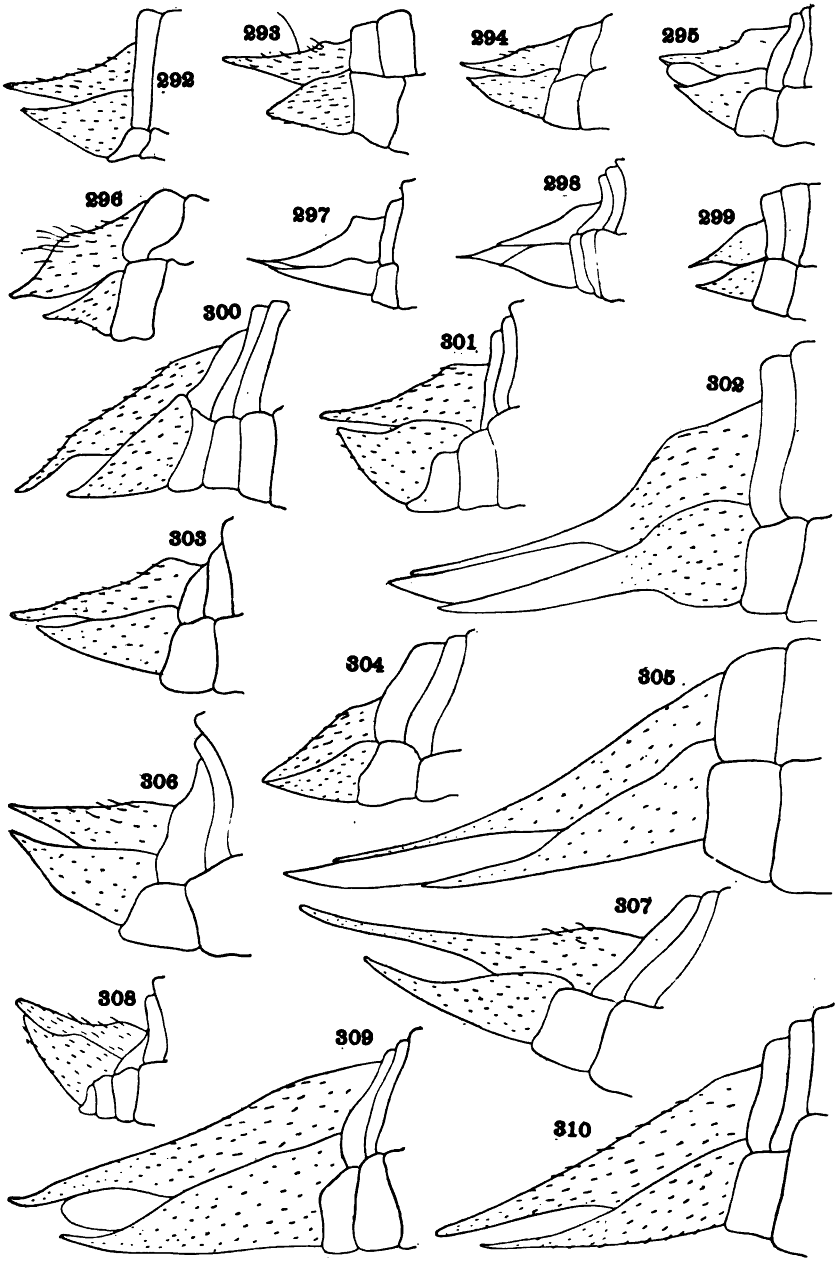
Male Cauda.

For explanation of plate see pages 176 and 177.



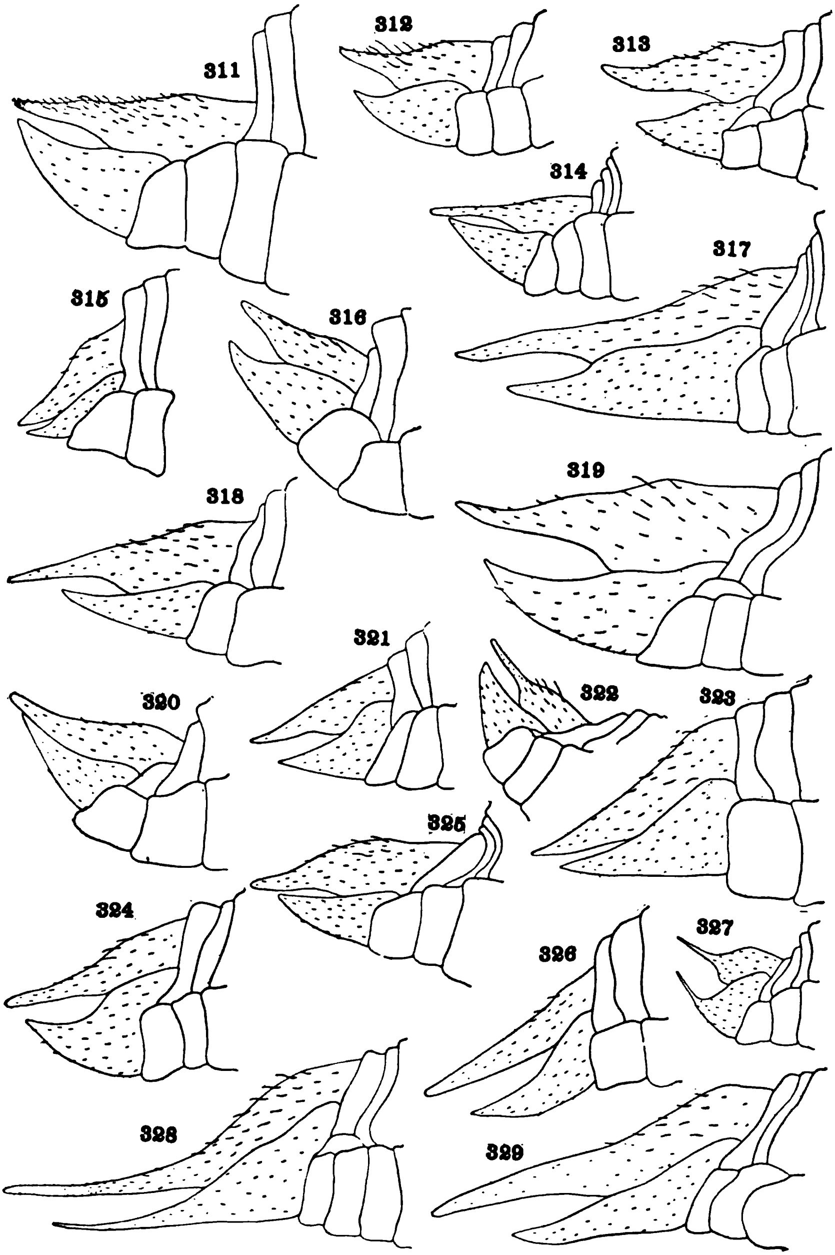
FEMALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGE 177.



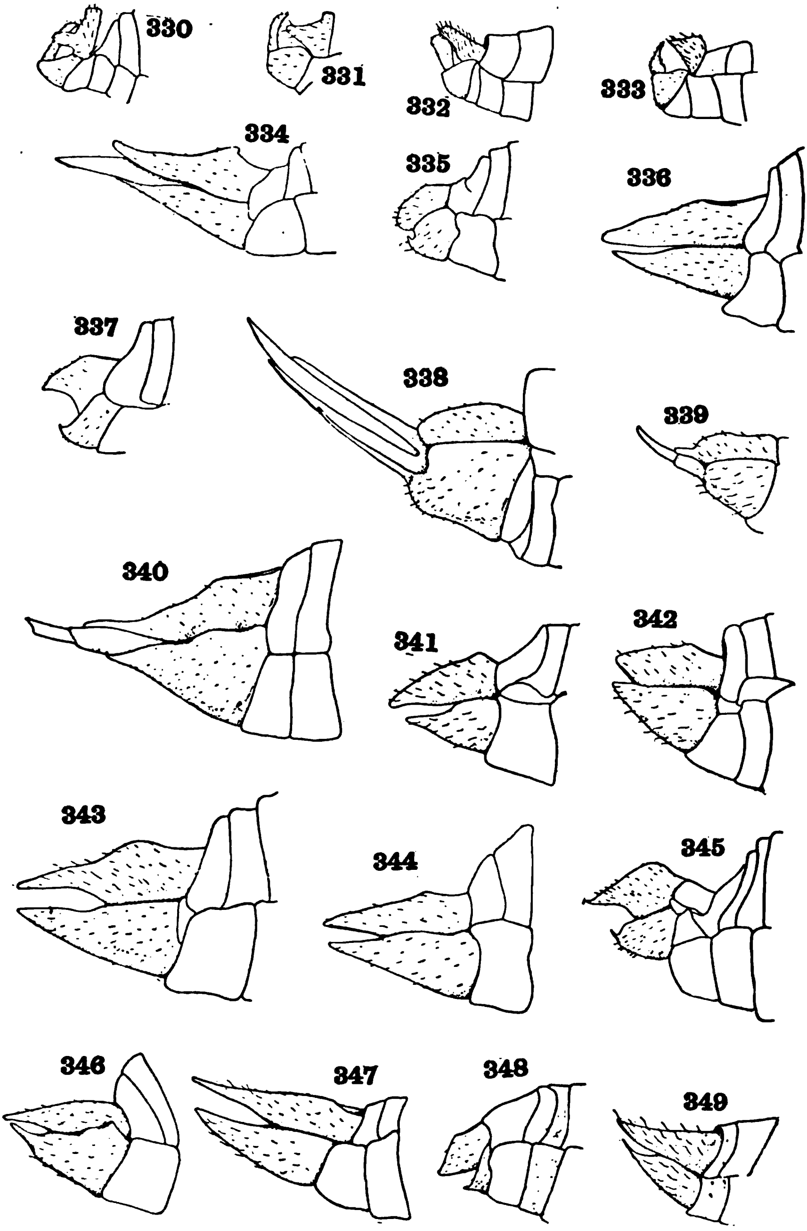
FEMALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGES 177 AND 178.



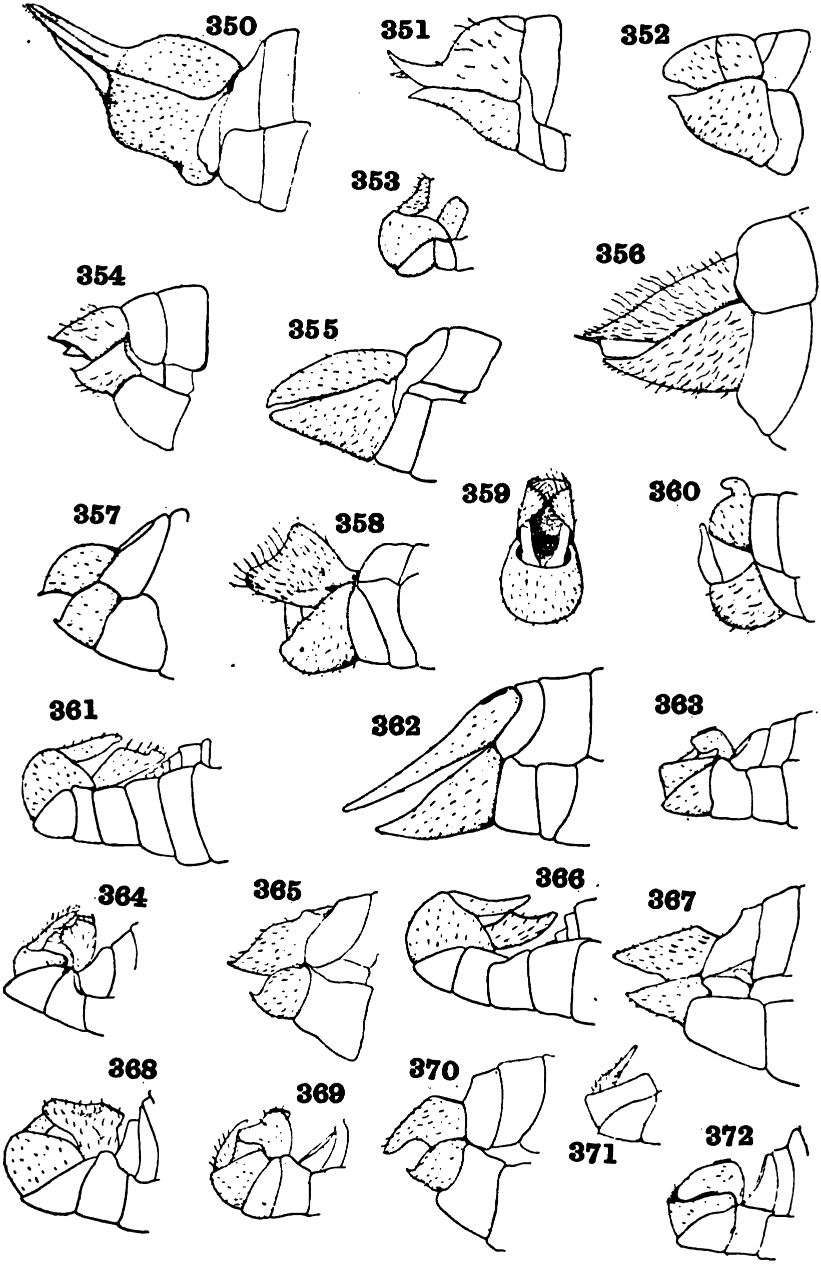
FEMALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGE 178.



MALE AND FEMALE CAUDA.

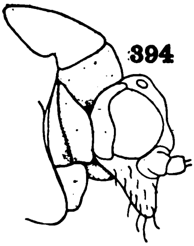
FOR EXPLANATION OF PLATE SEE PAGE 178.



MALE AND FEMALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGE 179.

394



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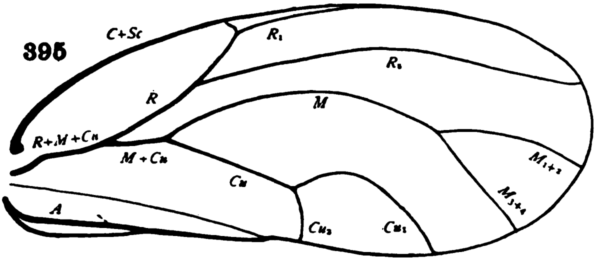

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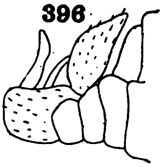

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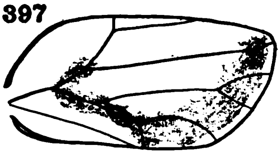

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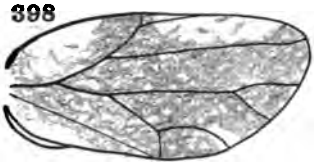

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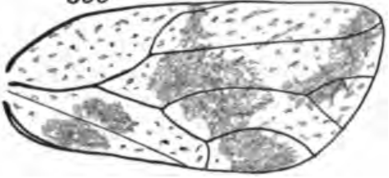

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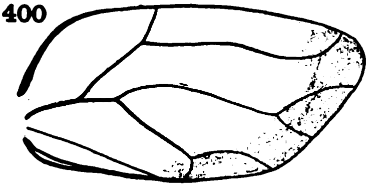

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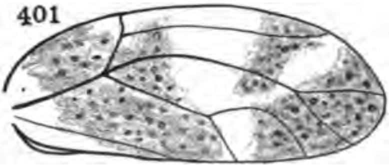

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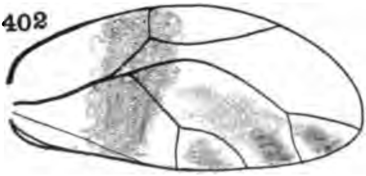

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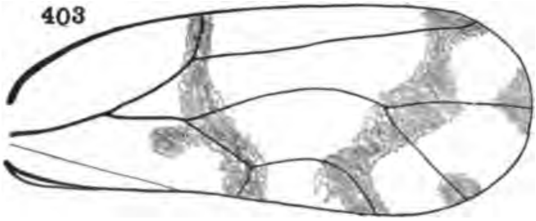

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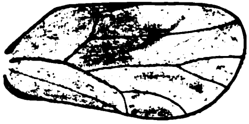

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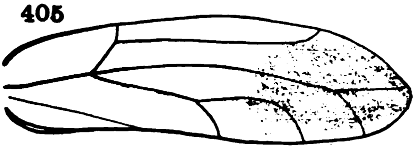

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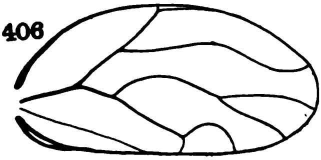
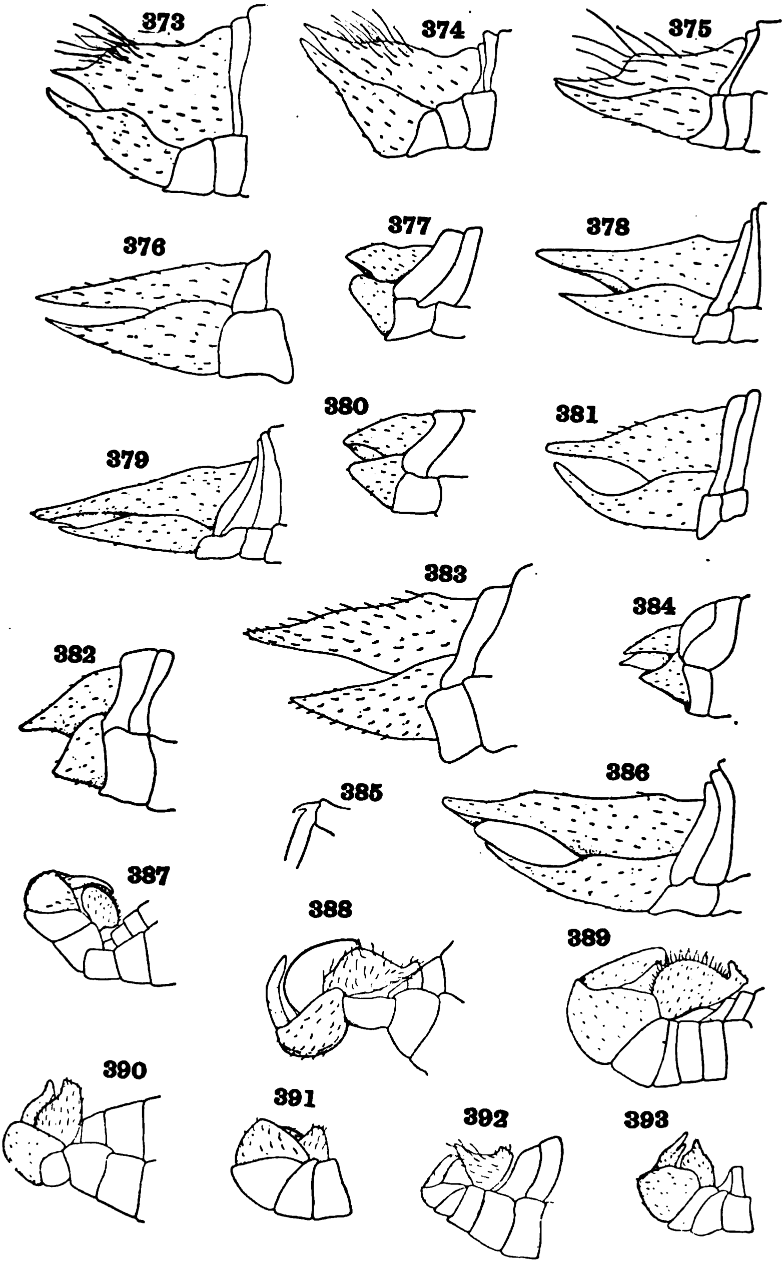


FOREWINGS OF PSYLLIDÆ.

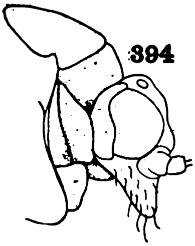
FOR EXPLANATION OF PLATE SEE PAGES 179 AND 180.



MALE AND FEMALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGE 179.

394



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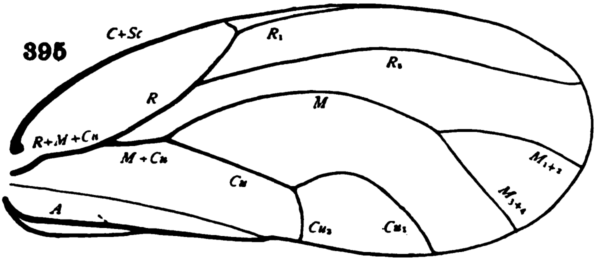

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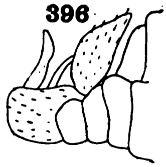

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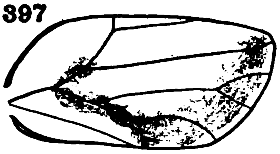

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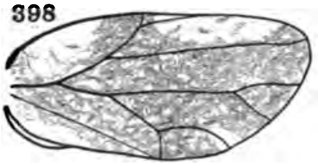

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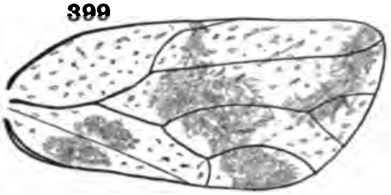

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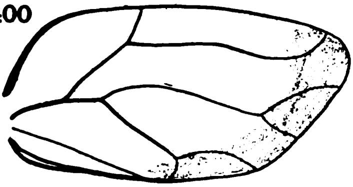

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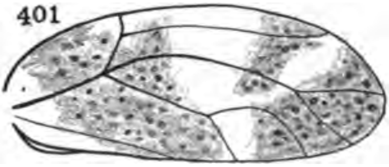

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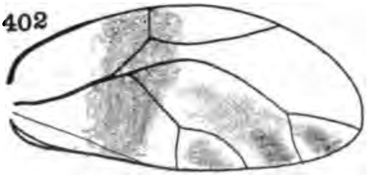

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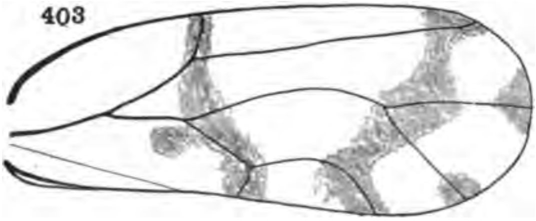

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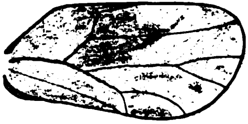

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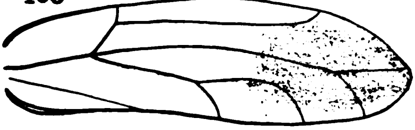

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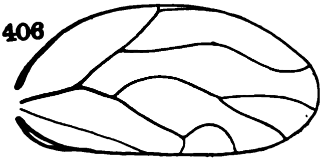
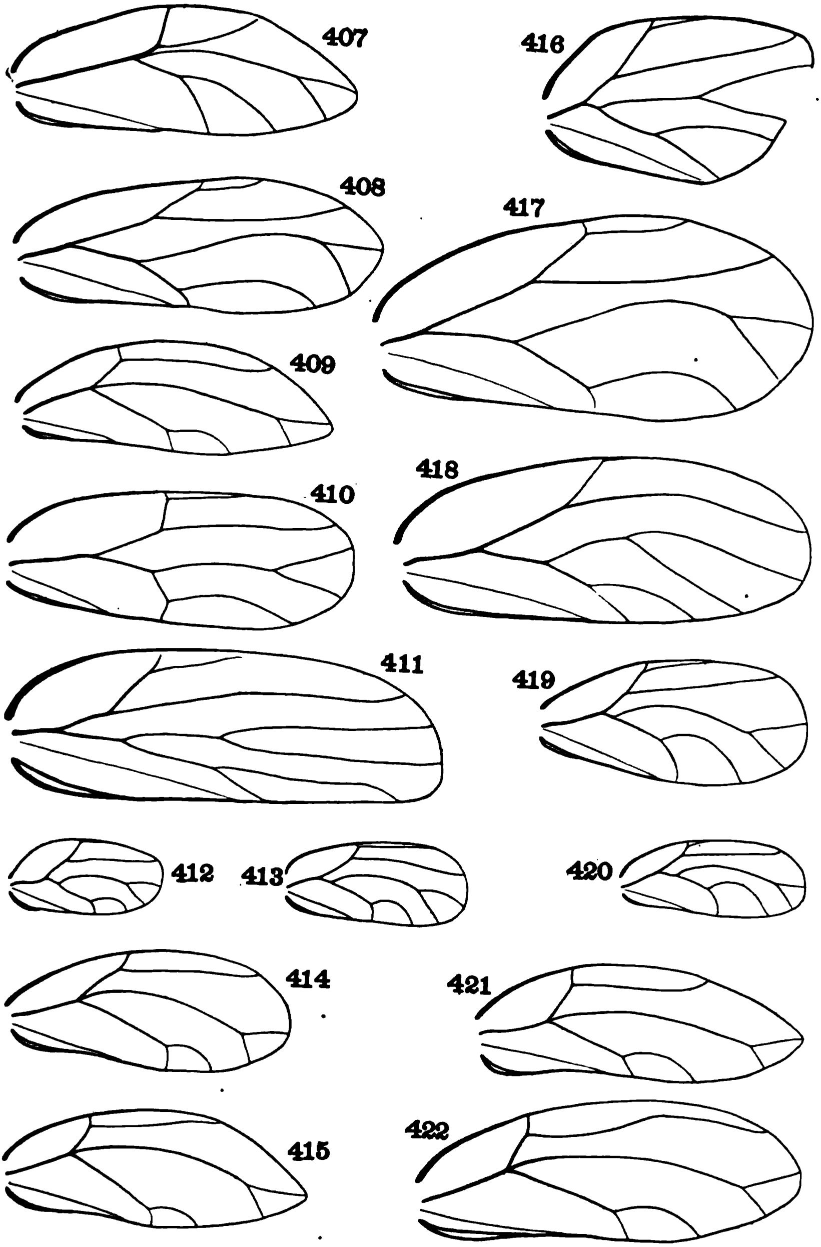


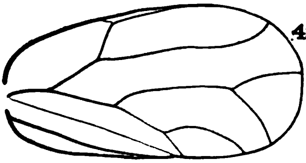
FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGES 179 AND 180.



FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATON OF PLATE SEE PAGE 180.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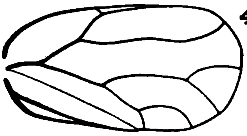
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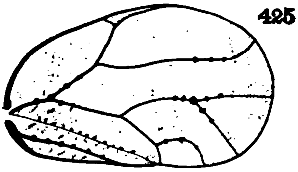
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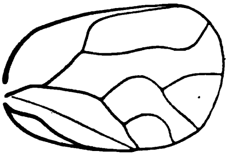
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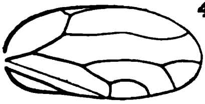
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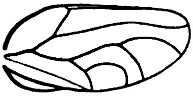
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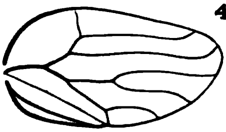
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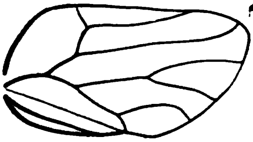
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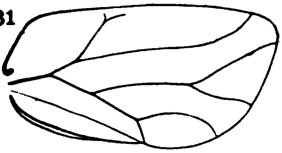
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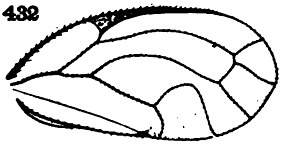
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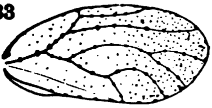
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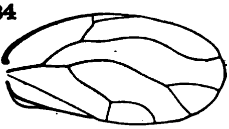
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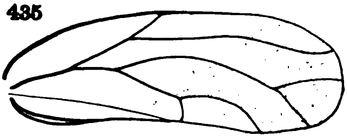
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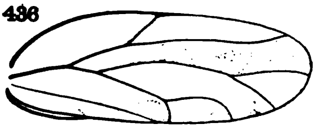
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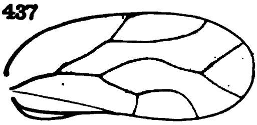
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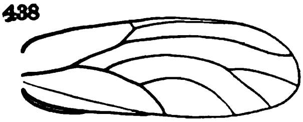
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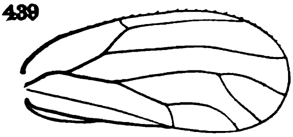
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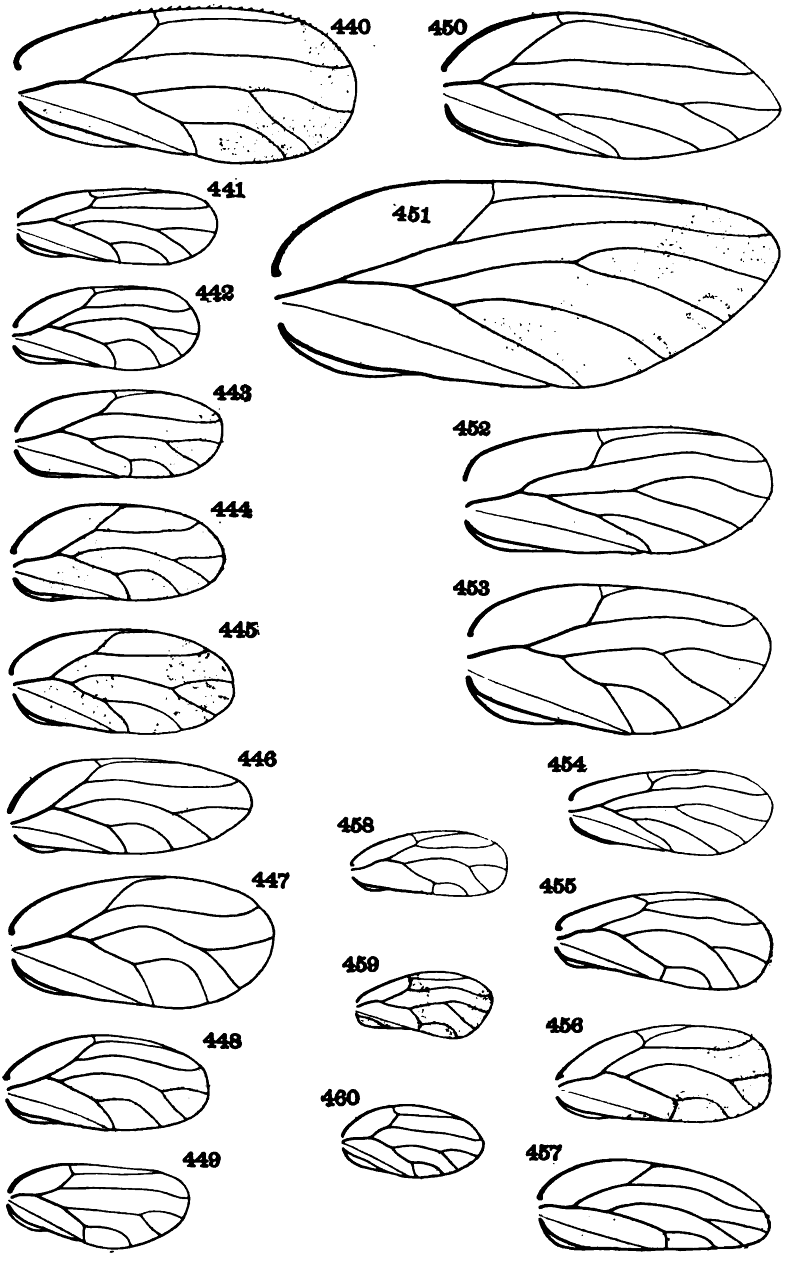
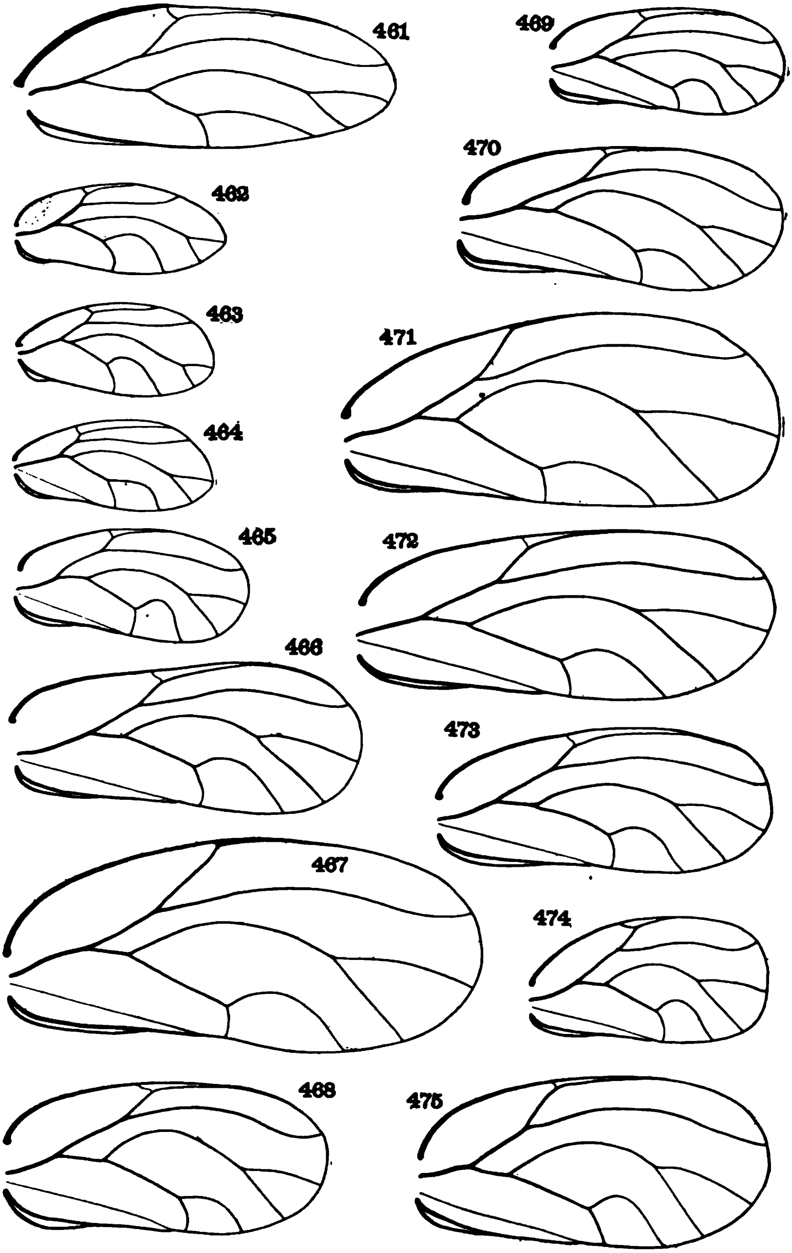
Forewings of Psyllidæ.

For explanation of plate see page 180.



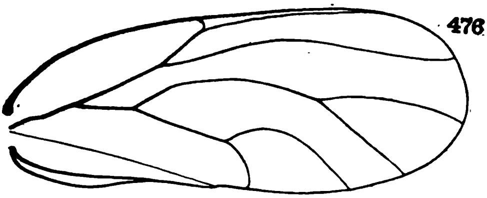
FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGES 180 AND 181.



FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 181.



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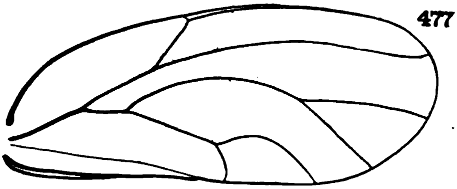

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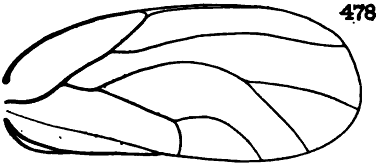

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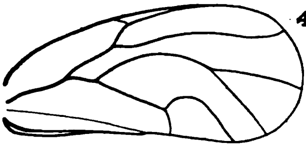

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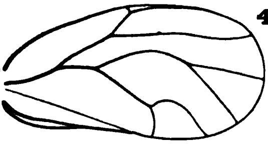

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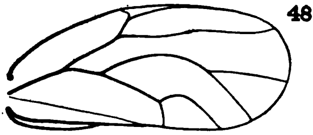

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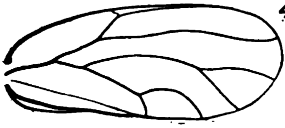

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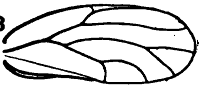

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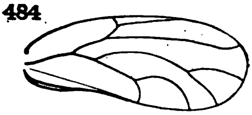

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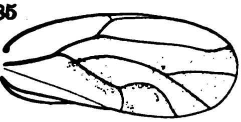

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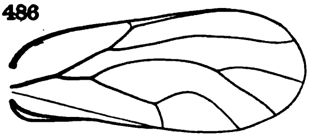

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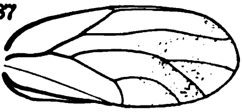

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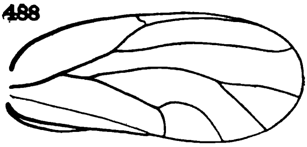

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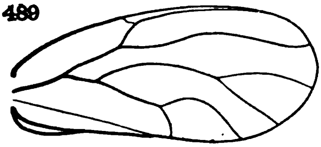

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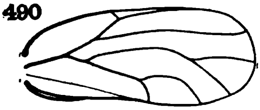

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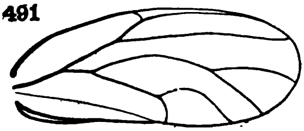

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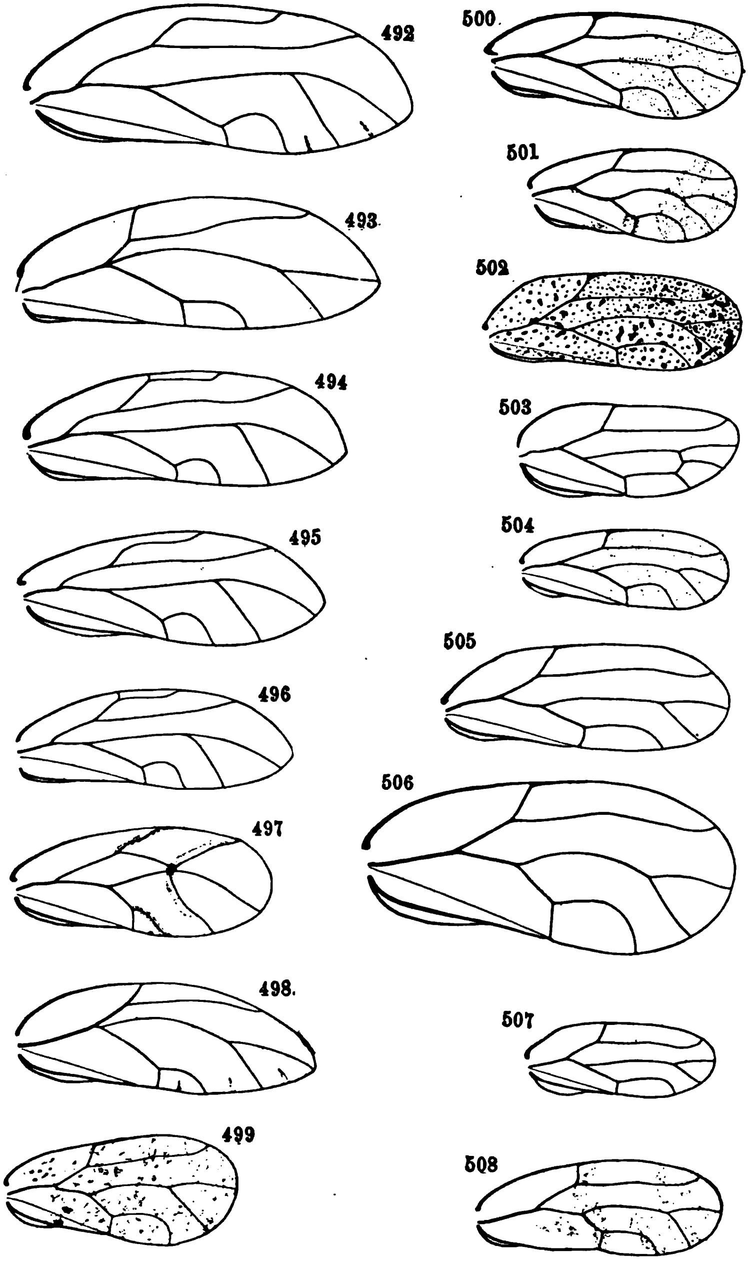
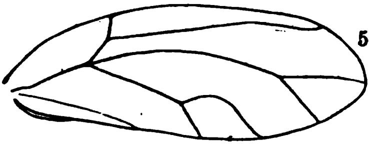
Forewings of Psyllidæ.

For explanation of plate see page 181.



FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGES 181 AND 182.



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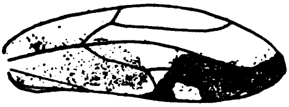

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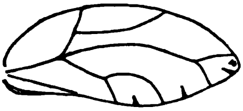

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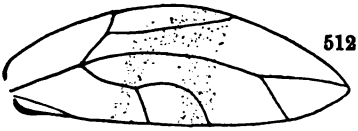

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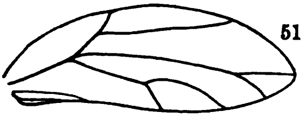

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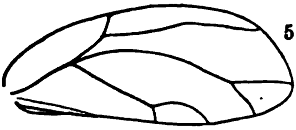

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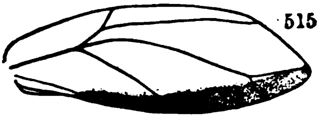

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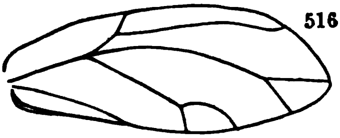

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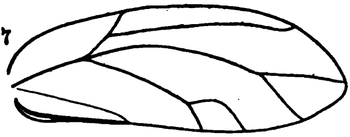

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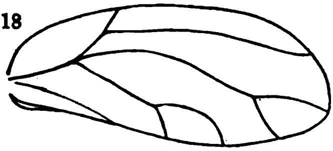

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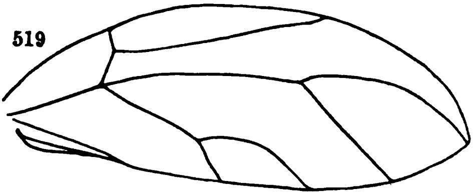

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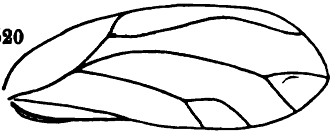

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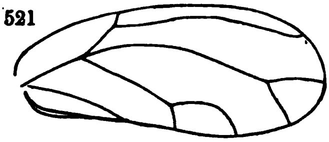

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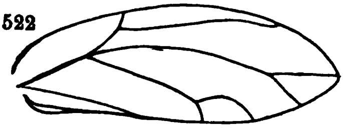

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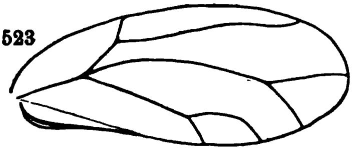

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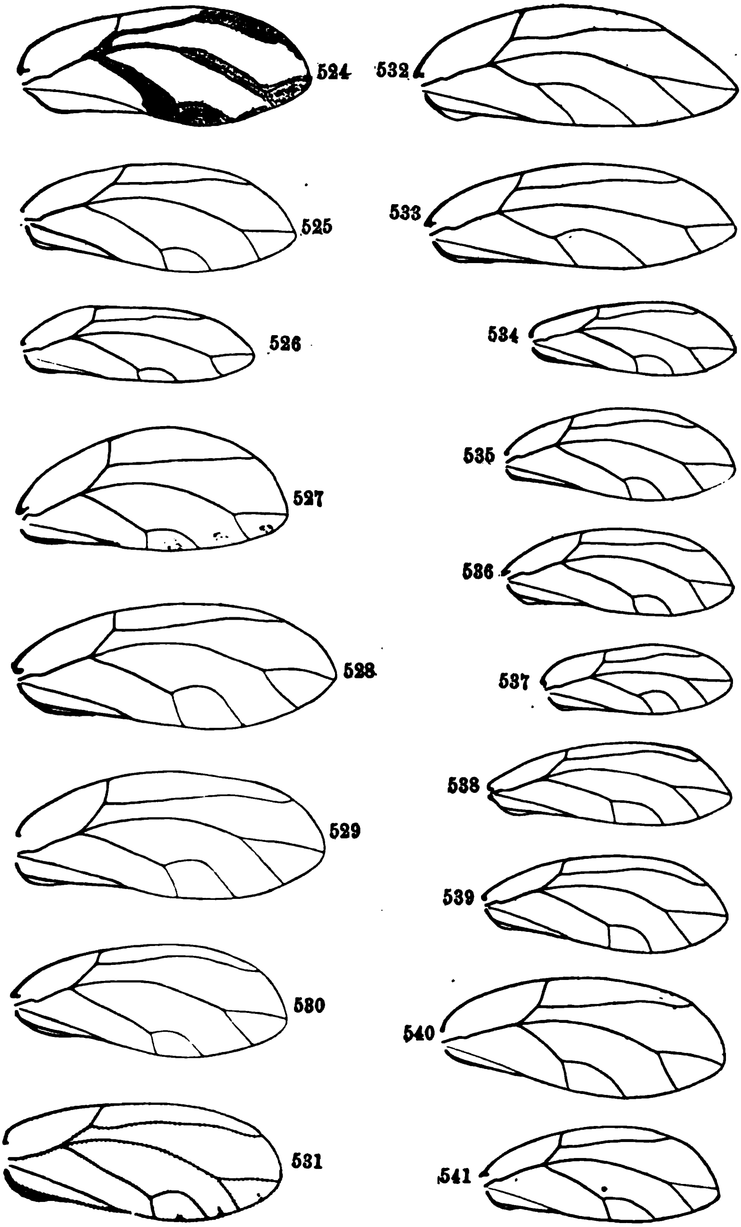
FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 182.



FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 182.

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[*Italics* indicate synonyms. Italics inclosed in brackets indicate manuscript names in literature, or present in cabinet collections.]

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